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NEUWIRTH (F.). **Houba Phoma betae Frank a její význam při chorobách vzcházejici Řepy.** [The fungus *Phoma betae* Frank, and its significance among the diseases of germinating Beets.]—*Ochrana Rostlin*, xiii, 3–4, pp. 115–135, 3 figs., 1933.

As a result of his cultural and other studies of *Phoma betae* [*R.A.M.*, xiii, p. 347], details of which are given, and also from a review of the work of other investigators on the pathogenicity of the fungus to germinating beet, the author concludes that under the climatic and soil conditions in Czecho-Slovakia it plays only a very secondary part in the etiology of the seedling diseases of the sugar beets. It is only able to attack seedlings weakened by other causes, and its control in Czecho-Slovakia may be easily effected by cultural practices tending to increase the vigour of the plants, as well as by the use of healthy certified seed of home production.

BLATTNÝ (C.). **Mosaika na Celeru (Apium graveolens).** [Mosaic of Celery (*Apium graveolens*).]—*Ochrana Rostlin*, xiii, 3–4, pp. 145–146, 1933.

The author reports a heavy outbreak in 1933 of celery mosaic [*R.A.M.*, xii, p. 136], this being stated to be the first record of the disease in Czecho-Slovakia. The spread of infection was correlated with the prevalence on the crop of the insect *Chlorita flavescens*. Field observations seem to indicate that the disease is not transmissible to celeriac, which remained healthy in close proximity to the diseased celery plants. Mosaic did not appear to reduce the susceptibility of affected celery plants to leaf spot (*Septoria apii*).

BÖNING (K.). **Versuche zur Bekämpfung der Septoria-Blattfleckenkrankheit des Selleries mit chemischen Mitteln.** [Experiments in the control of the *Septoria* leaf spot disease of Celery by chemical methods.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 9–10, pp. 231–237, 1933–4.

A tabulated account is given of the writer's experiments in 1933 at the Munich Institute of Agriculture and Plant Protection in the control of celery leaf blight (*Septoria apii*) by spraying and dusting with copper-containing preparations [*R.A.M.*, x, p. 771]. In

the seed-bed the incidence of infection on the Münchner Markt variety was reduced from 84·6 to 7, 7·3, and 2·5 per cent., respectively, by three applications on 8th and 20th May and 6th June of Bordeaux mixture, Wacker's Bordeaux mixture (copper-lime) [ibid., xii, p. 243], and cusisa dust [ibid., xi, pp. 348, 754, 764], the liquid mixtures being used at a strength of 1 per cent. on the first occasion and at 2 per cent. thereafter. Five applications of the same preparations (2 per cent. for the liquids) were given in the field on 8th and 19th July, 4th and 26th August, and 10th September. The best results were given by the Wacker brand of Bordeaux mixture, which resulted in an increased root [celeriac] production of 60 per cent. over the untreated plants, the corresponding figures for cusisa and ordinary Bordeaux being 55 and 41 per cent., respectively. In a further test to ascertain the relative efficacy of one, two, or three treatments with Bordeaux mixture, little difference in the incidence of infection was observed, but in the plots receiving the maximum number the total number of leaves per 100 plants was increased from 1,178 to 1,529 with a corresponding augmentation of 44 per cent. in the yield of roots. Of the seven varieties receiving five treatments with Bordeaux mixture the highest increase (134 per cent. of marketable roots over the unsprayed) was shown by Delikatess, and the lowest (25 per cent.) by Prager Riesen.

GUBA (E. F.) & HOLLAND (E. B.). **Effect of hydrocyanic acid gas on Cucumber plants previously sprayed with copper fungicides.**—*Massachusetts Agric. Exper. Stat. Bull.* 303, 16 pp., 4 pl., 1933.

Much injury is sometimes caused in Massachusetts cucumber greenhouses from the use of copper fungicides followed by fumigation by hydrocyanic acid gas as an insecticide. Experimental results [which are fully discussed and tabulated] showed that no injury resulted from the application of corona copper carbonate [*R.A.M.*, xii, p. 402] containing 18 or 50 per cent. copper, or of commercial basic copper sulphates (26·31, 52·95, or 53·31 per cent. copper), as used against *Erysiphe cichoracearum* and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xi, p. 152; xii, p. 358, *et passim*], followed by fumigation with the gas. These sprays, when diluted, are neutral to litmus. Gas applications caused or aggravated injury to cucumber plants previously sprayed with acid copper fungicides, i.e., normal and basic copper acetates and acid-Bordeaux, and also with neutral Bordeaux (4-10-50) prepared with milk of lime or filtered lime water.

The spray residue from injured foliage yielded water-soluble copper, the amount of which and the extent of damage generally tended to increase in proportion to the alkali content of the fungicide. The toxic salt is presumably calcium cuprocyanide, $CaCu_2(CN)_4 5H_2O$, or a similar soluble copper salt of cyanide.

It is recommended that fumigation should precede the application of the copper sprays or that only commercial basic copper carbonates, basic copper sulphates, or non-staining ammoniacal copper sprays should be used if fumigation is to follow.

Stapp (C.). **Über die bakterielle Ursache einer Blattfleckenkrankheit und Fruchtfäule der Gurken in Deutschland.** [On the bacterial origin of a leaf spot disease and fruit rot of Cucumbers in Germany.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 17–28, pp. 377–386, 7 figs., 1934.

The writer's examination of isolations from cucumber leaves and fruit affected by the angular leaf spot disease in central and south Germany left no doubt as to the substantial agreement of the causal organism with *Bacterium* (*Pseudomonas*) *lacrymans* [*R.A.M.*, xii, p. 92]. Some insignificant physiological differences are shown by the German strain, the dimensions being also slightly divergent, namely, 1·2 to 2·4 by 0·5 to 0·7 μ on bouillon agar, 1 to 1·8 by 0·5 to 0·7 μ on neutral potato agar, and 1·4 to 2·2 by 0·5 to 0·7 μ on carrot agar, compared with 1 to 2 by 0·8 μ in the original description of Smith and Bryan (*Journ. Agric. Res.*, v, p. 465, 1915).

Yoshii (H.). **Pathological studies on Watermelon wilt. II. On the migration of microconidia.**—*Bull. Sci. Fakultato Terkultura, Kjušu Imper. Univ.*, v, 5, pp. 577–589, 5 figs., 1 graph, 1933. [Japanese, with English summary.]

During the period from 27th June to 7th October, 1932, the total longitudinal growth of the mycelium of *Fusarium niveum*, the agent of watermelon wilt [*R.A.M.*, xiii, p. 5], amounted to only 600 mm. on a medium consisting of 100 c.c. onion decoction, 1 gm. of dipotassium hydrogen phosphate, 0·50 gm. magnesium sulphate, 900 c.c. water, and 20 gm. each of dextrose and agar. The growth of corresponding cultures of *Sclerotinia libertiana* [*S. sclerotiorum*] and *Valsa mali* [ibid., iv, p. 612] was considerably more rapid. In the host tissues the development of *F. niveum* is even slower than in culture, so that the presence of the fungus in parts of the plant remote from the point of entry of the mycelium at the root tip is evidently attributable to the migration of the microconidia (which measure 10 by 3 to 3·5 μ) from the mother hyphae along the transpiration stream. The microconidia are readily detachable from the short, simple conidiophores (on which they are produced at the tips or sides of the hyphae) in the vessels, and from 50 to 82 per cent. of them were found to be capable of traversing the tracheae of watermelon stems 6 mm. in diameter.

Joëssel (P. H.). **Essais de traitements contre l'oidium ou 'blanc' du Melon, en 1933.** [Experiments with treatments against *Oidium* or powdery mildew of Melon in 1933.]—*Prog. Agric. et Vitic.*, c, 51, pp. 599-603, 1933.

In a test for the control of melon powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xi, p. 94] carried out in 1933 in the vicinity of Avignon, 'Ananas (Melon) brodé d'Avignon' melons were given applications of (1) permanganate of potash 0·125 kg. per 100 l. water, (2) the same and sublimed sulphur, (3) as (2) with alkaline Bordeaux mixture (1 kg. copper sulphate and about 0·7 kg. caseinated lime per 100 l. water), (4) permanganate and Bordeaux mixture, (5) Bordeaux mixture, (6) lime-sulphur 0·5 kg. at 32° B. per 100 l. water, and (7) ditto and Bordeaux mixture. The applications of permanganate and lime-sulphur were made on 12th and

28th August and 15th September, and those of Bordeaux mixture and sulphur on 17th and 30th August and 18th September. 'Boule d'Or' melons were given identical treatments, except that the applications of the 12th and 17th August were omitted. One plot of each variety remained untreated.

When each variety was first treated, the Ananas d'Avignon melons were completely unaffected and the Boule d'Or showed a few spots of mildew. On 22nd August, a few lesions were noted on the untreated Ananas d'Avignon. By 28th August, the untreated melons and those which had received permanganate had become affected, whereas those given lime-sulphur and Bordeaux mixture were still healthy. By 12th September most of the controls were completely dried up, whereas the plots treated with lime-sulphur or Bordeaux mixture showed only slight infection on the under surface of the leaves. The curative effect of the permanganate was only transitory, both varieties after being treated on 28th August being severely attacked on 12th September. The sulphur caused serious scorching on Ananas d'Avignon.

No appreciable differences were observed between the effects of the lime-sulphur and Bordeaux mixture schedule, the Bordeaux mixture and permanganate, the Bordeaux mixture alone, and the lime-sulphur alone. On the whole, the disease caused least damage in the plots treated with Bordeaux mixture, the action of which was mainly to retard infection [ibid., x, p. 702]; the lime-sulphur gave slightly less satisfactory results.

Garcia (F.). **Reduction of Chile wilt by cultural methods.**—*New Mexico Agric. Exper. Stat. Bull.* 216, 15 pp., 4 figs., 1933. [Received April, 1934.]

In field tests [which are described, and the results of which are tabulated] carried out over a number of years in New Mexico to ascertain the effect of different cultural practices on the incidence of chilli pepper [*Capsicum annuum*] wilt (*Fusarium annuum*) the average amount of infection in the plots (irrigated at two- or three-week intervals) cultivated according to the level, native-ridge, and the new furrow-ridge [*R.A.M.*, xii, p. 748] methods was, respectively, 41·7, 19·2, and 7 per cent. With irrigation at 7-day intervals the level-culture method gave 54·7 per cent. average wilt, as against 21·7 per cent. for the furrow-ridge, the corresponding figures for 14- and 21-day irrigations being, respectively, 33·8 and 7·8 and 21·9 and 5 per cent.

Baker (J. A.). **Mushroom growing in Province Wellesley & Penang.**—*Malayan Agric. Journ.*, xxii, 1, pp. 25–28, 6 figs., 1934.

The commercial growing of mushrooms was introduced into Malaya by the Chinese in 1932, the species cultivated being *Volvaria volvacea*, which is the principal species cultivated in the Dutch East Indies. Bundles of rice straw are soaked in water for two days and used to cover an earth bed on which a layer of spawn is distributed round the edges. The mass is pressed down, and another layer of spawn laid on it, the process being repeated with a third layer. A kind of thatch is then added, the bed being completed

by spreading a thin layer of haulms over it from side to side. As each layer is made it is copiously watered. Such a bed is about 4 ft. high, requires about 25 galls. of spawn for a bed 16 by 3½ ft., and should be surrounded by a shallow ditch. No water is applied for a week after the spawn has been sown, but subsequently the bed is watered twice a day.

The first mushrooms may be harvested about 25 days after sowing, and the beds are broken up after about three months when the whole mass of straw is permeated by the mycelium, which provides spawn for the new beds. A bed of the size mentioned yields enough spawn for ten new ones. Under favourable conditions of moisture a bed of this size yields 1⅓ to 2⅔ lb. of mushrooms daily. The mushrooms are marketed either in the fresh or dried condition and are consumed chiefly by the Chinese, the Malays ordinarily eating only the wild species. *V. volvacea* closely resembles the European mushroom [*Psalliota arvensis* and *P. campestris*] in flavour.

Mushroom cultivation would probably form a profitable subsidiary industry to rice growing; the only materials required are straw, water, and spawn, the work is not laborious, and there is a ready market for the produce.

Blattný (C.). **Jde u mosaiky Révy Vinné o jediný virus?** [Is only one virus involved in Vine mosaic?]—*Ochrana Rostlin*, xiii, 3–4, pp. 104–115, 5 figs., 1933. [German summary.]

This is a brief account of continued grafting experiments from 1931 to 1933 to study the nature of the Central European vine mosaic as it occurs in Czecho-Slovakia [*R.A.M.*, xi, p. 280; xii, p. 419], the results of which [presented in tabular form] showed that the disease is graft-transmissible to healthy varieties of the European *Vitis vinifera* (among which Portuguese Blue is particularly susceptible) but not to American varieties. Some of the European varieties, e.g., White Riesling, may carry the mosaic in a latent form. 'Roncet' [ibid., xi, p. 280] was seldom transmitted by grafting to American vines; when transmitted to mosaic Portuguese Blue stocks, it caused the development on the latter of a new set of symptoms, in the form of a gradual necrosis of the leaves, starting from the margins. This condition was transmitted to healthy Portuguese Blue stocks, in which it caused the same symptoms, but only of a transient nature and eventually disappearing. When returned to 'roncet' diseased stocks, this condition caused a temporary inhibition of growth, and defoliation. These results are interpreted to indicate that the Czecho-Slovakian vine mosaic very probably consists of two virus entities, one of which is able to exist independently for a short time; it is believed that this entity is narrowly specialized to a few of the European varieties, and that in nature it contributes in a marked degree to the death of the diseased stocks.

Vielwerth (V.). **Mosaika Americké Révy vinné.** [Mosaic of the American Vine.]—*Ochrana Rostlin*, xiii, 3–4, pp. 83–90, 1933. [German summary.]

The author states that an assortment of 17 American stock-vine

varieties [a list of which is given], which were planted in 1924 in an experimental field at Bratislava [Czecho-Slovakia] to replace another lot of American varieties exhibiting signs of degeneration, then ascribed to old age, grew normally until 1930, when they suddenly developed pathological symptoms resembling in an intensified form those of the former vines. The disease, which was shown to be transmissible by grafting to two varieties of the European *Vitis vinifera* (Malinger and Italian Riesling), is characterized by a general chlorosis of the foliage, with local mosaic-like patterns, yellow mottling, or red pigmentation of certain areas of the leaf blade, which dry up and drop out. Another symptom is a more or less severe deformation of the leaves, which are crimped between the main veins. Many of the affected stocks show very poor growth. Some of the varieties or individual vines exhibit all the symptoms described in one and the same plant. There was clear-cut evidence of varietal variations in susceptibility to the disease. The experimental plot is strictly quarantined, and is preserved for further systematic studies of the trouble.

Viala (P.) & Marsais (P.). **Sur le court-noué, maladie parasitaire de la Vigne.** [Court-noué, a parasitic disease of the Vine.]—*Comptes rendus Acad. des Sciences*, cxcviii, 1, pp. 26–29, 1934.

A parasitic fungus is stated by the writers to be responsible for the majority of cases of court-noué of the vine in France [*R.A.M.*, viii, p. 421; x, p. 433]. This disease is characterized by various symptoms of progressive degeneration, including stunting of the stock, excessive production of secondary shoots, and curtailment of the internodes (the nodes sometimes being almost imbricated); the leaves are small and laciniate, and the flowers suppressed. The climax of the disease may not be reached for ten years or so, but from the second or third year after infection the yield begins to fall off. Disorders similar to court-noué are known in Burgundy and Aude, respectively, as 'roncet' and 'vigne persillée' or 'jauberdat', in Italy as 'mal nero', in Portugal as 'marromba', and in Germany as 'reisigkrankheit' [ibid., xiii, p. 213].

The most characteristic lesions of court-noué, which the writers have observed in all the French, Algerian, and foreign viticultural regions visited by them, are situated in the pith of the stem whence the fungus, entering through pruning wounds, passes to the xylem and phloem. The blackened tissues are occupied by a dark brown to black mycelium with paler or colourless extensions. In culture the mycelium is snow-white at first, darkening with age, and is composed of septate hyphae, 0·5 to 5 μ in diameter. No true conidia were formed on these hyphae either in nature or in culture but the fungus can apparently be propagated by budding cells and large oidia of variable shape. Intensely black and hard, spherical pycnidia, up to 90 μ in diameter, frequently aggregated in groups of 2 to 12, were obtained in pure culture and contained hyaline, navicular, thick-walled pycnospores, 1·5 by 0·5 μ, tapering at both ends, which in turn produced the above-mentioned mycelial elements. The fungus is referred to the Sphaerioideae, occupying

a position close to *Piptostomum*. It is considered to be new and is named *Pumilus medullae*.

The addition of arsenical compounds to the nutrient media at the rate of 1 part per mille completely prevented the development of *P. medullae*, but the treatment of pruned stems with arsenical solutions is likely to present great difficulties owing to the rapidity of invasion following the first wounds.

[This paper also appears in *Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 46–50, 1934; *Rev. de Vitic.*, lxxx, 2063, pp. 21–23, 1934; and *Prog. Agric. et Vitic.*, ci, 4, pp. 77–82, 1934.]

BRANAS (J.) & DULAC (J.). **Le traitement du mildiou de la Vigne par les bouillies cupriques.** [The treatment of Vine mildew by copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 1, pp. 33–39, 1934.

In this note (to which P. Viala contributes a foreword) the writers seek to establish the basis of efficacy of Bordeaux mixture in the control of downy mildew of the vine (*Plasmopara viticola*) in France [*R.A.M.*, xiii, pp. 148, 149, 214, 314]. Their researches indicate that the partial or total failure of the mixtures in such epidemics as those of 1910, 1915, 1930, and 1932, when the yield was reduced by 20 to 60 per cent., are due to the insufficiency of their copper content. To be effective the solutions formed on the plant should have a copper content exceeding 1 in 100,000.

[This paper is reprinted in *Prog. Agric. et Vitic.*, ci, 5, pp. 107–109, 1934, and with the earlier ones in the same series, in *Ann. École Nat. d'Agric. de Montpellier*, xxiii, 1, pp. 44–56, 1934.]

RIBÉREAU-GAYON (J.). **Sur le traitement du mildiou de la Vigne par les bouillies cupriques.** [On the treatment of Vine mildew by copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 5, pp. 184–189, 1934.

The factors governing the toxicity of copper compounds to *Plasmopara viticola* have not, in the writer's opinion, been correctly interpreted by Branas and Dulac [see preceding abstract]. As already pointed out in an earlier paper [*R.A.M.*, xii, p. 674], the fungicidal action of a solution depends less on its strength than on the maintenance of the concentration at a given level—a condition realized when a zoospore comes into contact with a particle of copper, which dissolves *pari passu* with the process of fixation of the copper ions by the spore.

MANZONI (L.). **Rilievi anatomici su Viti colpite dal fulmine.** [Anatomical notes on Vines struck by lightning.]—Reprinted from *Annuario Staz. Sper. di Vitic. e di Enol. di Conegliano, 1934*, iv, 2, 22 pp., 7 pl., 1934.

An account is given of an anatomical examination made in April, 1933 of the current year's branches, three-year-old wood, and roots of young wild vines (Teleki 8) planted for stock purposes in the spring of 1931 and struck by lightning, presumably along the wires on which they were trained, in July, 1932. The injuries and disturbances produced, which resulted in the rapid death of the upper parts, while the base remained alive and renewed growth

later on, are fully described and figured, the immediate and more remote effects being enumerated in a summary. It was not until an attempt was made to use the vines for stocks in grafting in the spring of 1933, that the tissue injuries, which rendered grafting impossible, were fully revealed. A bibliography of 12 titles is appended.

MONTEMARTINI (L.). **I parassiti e le malattie delle piante coltivate nella Sicilia occidentale durante il biennio 1932–33.** [Parasites and diseases of cultivated plants in Western Sicily during 1932–33.]—*Riv. Pat. Veg.*, xxiv, pp. 11–36, 1 fig., 1934.

This report on plant diseases in the vicinity of Palermo [cf. *R.A.M.*, xi, p. 495] includes the following items of interest. The most prevalent wheat rust is *Puccinia triticina*, which attacks all the varieties commonly grown, Rossello and Bidi only slightly and Majorca and Mentana very severely. The aecidial stage has not been found locally. Favoured by rain during April and May, 1932, foot rot of wheat associated with *Fusarium culmorum*, *Ophiobolus graminis*, and an undetermined fungus was widespread. The disease of mandarins [*Citrus nobilis* var. *deliciosa*] ('mal dalla terra') caused by *Bacterium citri deliciosae* and characterized by irregular, sharply delimited, depressed, brick-red spots on the skin, which wrinkles and withers, is sometimes severe locally; it is quite distinct from melanosis ('mal di terra') in Catania which is due to *Cytosporina citriperda* [ibid., xii, p. 758]. The leaves and fruit of all varieties of plum in one orchard were attacked by *Bacterium pruni*, while loquats (*Eriobotrya japonica*) were severely affected by *Bacillus amylovorus* [ibid., xi, p. 117]. Custard apples [*Anona* sp.] were injured by a root rot due to *Rosellinia necatrix*. A dry spotting of walnut leaves appeared to be due to *Labrella* [*Leptothyrium*] *coryli*. Pistachio [*Pistacia vera*] leaves bearing profuse, whitish spots with a dark border showed the presence of a *Septoria* differing from *S. pistaciae*.

PEROTTI (R.). **Note fitopatologiche per gli anni 1931–33.** [Phytopathological notes for the years 1931–33.]—*Boll. R. Ist. Sup. Agr. di Pisa*, ix, pp. 439–457, 1 graph, 1933. [Received May, 1934.]

Notes are given on the fungous and bacterial diseases and insect pests attacking cereals, vegetables, fruit trees, olives, vines, and ornamentals during 1931–3 in the districts of Italy under the supervision of the Pisa Agricultural Institute.

Augalų apsaugos stoties 1933 metų darbų apyskaita. [Report of the activities in 1933 of the Plant Protection Station.]—Pamphlet issued by Žemės Ūkio Rūmų Leidinys, Kaunas [Kovno], 47 pp., 10 figs., 1934. [German summary on pp. 30–33.]

In the mycological section of this report [pp. 4–33], V. Vilkaitis states that following the intensification of sugar beet growing in Lithuania in recent years, this crop is increasingly suffering from heart rot [*R.A.M.*, xiii, p. 72]. Experiments in 1933 showed that

in a severely affected field, the incidence of the disease was reduced from 51·7 per cent. to 4·4 per cent. by the application to the soil of 5 kg. borax (in water solution) per hect., while applications of 10 and 20 kg. reduced it to 1·2 and 0·5 per cent., respectively. The addition of about 8 gm. borax to 1 kg. sugar beet seed somewhat improved the stands but did not control the disease. One application of 2 per cent. Bordeaux mixture reduced the percentage of sugar beet plants severely affected with leaf spot (*Cercospora beticola*) [ibid., xiii, p. 211] from 53·95 in the controls to 4·61, and increased the percentage of slightly spotted plants from 17·17 to 73·37, but indicated that one spraying is not sufficient to control the disease.

Details are given of experiments in soil artificially infected with wheat bunt spores (*Tilletia tritici*) [*T. caries*], the results of which showed that the amount of ceresan dust adhering to seed-grain treated with this preparation is not sufficient to control the development of the disease in heavily infected soils.

Pole Evans (I. B.). **Safeguarding the soil products of the Union. Annual Report of the Division of Plant Industry.**—*Farming in South Africa*, viii, 93, pp. 486–493, 1933.

This report contains, in addition to various items already noticed from other sources, the following information of phytopathological interest. Notes are given on storage and transport diseases of exported plums, peaches, and grapes. Oranges treated by the bleaching method for the removal of sooty blotch (*Gloeodes pomigena*) [see below, p. 437] have been exported and proved commercially satisfactory. No fresh outbreaks of citrus canker [*Pseudomonas citri*: *R.A.M.*, viii, p. 775] were detected among the 125,871 orchard and 26,640 nursery trees examined during 1933. Scaly bark [psorosis: ibid., x, p. 97] was found on 223 of the 393,771 trees inspected in the northern Transvaal and on 3 out of 13,000 in the Cape Province.

In forest plantations in the northern Transvaal *Armillaria mellea* [ibid., xii, p. 142] was found to be spreading rapidly, attacking young *Pinus longifolia* trees and five- to six-year-old *P. patula* and *P. caribaea*. Extension was found to occur exclusively by direct root contact, no rhizomorphs being formed under local conditions. The sources of infection for the pines were the indigenous *Parinarium mobola* and stumps of *Eugenia gerrardi* and *Luchnopylis* [*Nuxia*] sp. The yellowing and death of *Pinus longifolia* in the same district is probably but not certainly due to *Helicobasidium compactum* [ibid., ix, pp. 9, 425].

Van Der Byl (P. A.). **Agricultural education, extension and research work in the winter rainfall area. Report of the Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch.**—*Farming in South Africa*, viii, 93, pp. 515–517, 1933.

The following are among the items of phytopathological interest occurring in this report. Pear trees suffered extensive injury from

bacterial blossom disease [*Bacterium nectarophilum*: *R.A.M.*, xi, p. 18] in several districts; control measures are being tested and various aspects of the disorder studied. *Sclerotinia sclerotiorum*, the causal organism of green rotting in apricots [ibid., xi, p. 157], was responsible for considerable losses and also induced a die-back of the twigs.

Sulphur dioxide fumigation [ibid., xii, p. 46] was found to be very effective against *Botrytis* rot of grapes for export but less so in the case of *Penicillium* and *Aspergillus*. The colour and flavour of the fruit were impaired by unduly strong concentrations of the gas or protracted treatment. Fumigation should preferably be done before the bunches are packed and wrapped.

The dying-out of fir trees in the George area was found to be primarily due to unfavourable growth conditions, the effect of *Diplodia pinea* [ibid., viii, p. 535] being purely secondary.

KOSTOFF (D.). **Tumor problem in the light of researches on plant tumors and galls and its relation to the problem of mutation (a critical review from biophysical, biochemical and cytogenetical point of view.)**—*Protoplasma*, xx, 3, pp. 440–456, 1933.

A comprehensive summary and discussion are given of recent and contemporary researches on the problem of plant tumours and galls (especially those caused by *Bacterium tumefaciens*) [*R.A.M.*, xiii, p. 16] in relation to human and animal cancer, considered under various aspects. The bibliography comprises 37 titles.

ARTEMOFF (P. K.). К вопросу о поражаемости сортов зерновых культур грибными болезнями. [On the question of varietal susceptibility of cereals to fungal diseases.]—*Bull. Appl. Bot. Genetics, and Plant Breeding*, Leningrad, Ser. A (*Plant Industry in U.S.S.R.*), 7, pp. 75–90, 7 figs., 1933.

To illustrate the very considerable economic losses caused by fungal diseases to cereal crops in Russia, the author states that the shortage in winter and spring wheats due to rusts [*Puccinia* spp.] in 1932 is officially estimated to have been about 51 million cwt., and that in rye, wheat, oats, barley, and millet [*Panicum miliaceum*] due to various smuts to have totalled nearly 18·5 million cwt. These figures show that the cereal rusts are by far the more important diseases, and since 1925 a very large number of home-grown and imported varieties and pure lines of wheats have been officially tested throughout Russia for their resistance to the rusts, and also to the smuts. The results [shown in the form of tables] indicate that the home-produced selections and pure lines are inferior both in yield and in disease resistance to the American importations, among which Kanred × Fulcaster 266287, 266313, 266319, and 266324, Illini Chief × Marquis 242216, Fulhard, and Kawvale exhibited a high resistance to brown rust [*P. triticina*] in 1932, when the disease occurred in epidemic form, together with high resistance to bunt [*Tilletia caries* and *T. foetens*] and loose smut [*Ustilago tritici*], and high yield. There is good evidence that the

productivity and disease resistance of local wheats may be improved by crossing them with the American ones.

AUSEMUS (E. R.). **Correlated inheritance of reaction to diseases and of certain botanical characters in triangular Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 1, pp. 31–57, 5 figs., 1934.

A tabulated account is given of the author's studies, started in 1928 [*R.A.M.*, vii, p. 433], of the genetics of inheritance of reaction to stem [black] rust (*Puccinia graminis*), bunt (*Tilletia tritici*) [*T. caries*], and black chaff (*Bacterium translucens* var. *undulosum*), and of awn characters and colour of the coleoptile, in the three spring wheat crosses Hope × Marquillo, Hope × Supreme, and Marquillo × Supreme, in which Hope is highly resistant to black rust, resistant to bunt, and susceptible to black chaff; Marquillo is moderately resistant to the rust, semi-resistant to bunt, and resistant to black chaff; and Supreme is susceptible to the rust and bunt, but resistant to black chaff. In the Hope × Marquillo cross, inheritance of mature plant reaction to the rust appeared to depend on three or more factors. The factor or factors for the mature plant resistance of the Hope type did not appear to be allelomorphic to those of the semi-resistant type of Marquillo. In the Hope × Supreme cross, inheritance of the mature plant resistance appeared to depend on at least two factors, and in the inheritance of the parental reaction in the Marquillo × Supreme cross at least three factors appeared to be involved. When hypodermically inoculated in the greenhouse with physiologic form 36 of black rust, the F_3 lines of the Hope × Marquillo and Hope × Supreme crosses segregated approximately in the ratio of 1 resistant to 2 segregating to 1 susceptible, while all the F_3 lines of Marquillo × Supreme were susceptible.

While the number of genetic factors involved in the inheritance of reaction to bunt in the three crosses studied could not be determined, the indications were that the susceptibility of the hybrids tends to increase with the higher susceptibility of one or both parents. Similarly, no conclusion could be reached as to the number of factors concerned in the inheritance of reaction to black chaff; segregation occurred in the progenies of the two crosses having Hope as one of the parents, and did not occur in the Marquillo × Supreme cross.

There also was evidence that the following combinations of characters are independent: mature plant reaction to black rust in relation to bunt, seedling reaction (except in Hope × Marquillo), awnedness, and coleoptile character; black chaff in relation to bunt, seedling reaction, awnedness, and coleoptile colour; bunt in relation to seedling reaction, awnedness, and colour of the coleoptile; awnedness in relation to seedling reaction and colour of coleoptile; and seedling reaction in relation to colour of coleoptile. There appeared to be a tendency to linkage or association of mature plant reaction to black rust and seedling reaction in the Hope × Marquillo cross, and mature plant reaction to black rust and reaction to black chaff in the crosses of Hope with Marquillo and Supreme. There did not appear to be any correlation between

reaction to the black rust and stomatal behaviour of the crosses under field conditions.

HAYES (H.K.), AUSEMUS (E. R.), STAKMAN (E.C.), & BAMBERG (R.H.). **Correlated inheritance of reaction to stem rust, leaf rust, bunt, and black chaff in Spring-Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 1, pp. 59–66, 1934.

This is a brief, tabulated report of the authors' genetical studies [cf. preceding abstract] of correlated inheritance of reaction to stem [black] rust (*Puccinia graminis*), leaf [brown] rust (*P. triticina*), bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], and black chaff (*Bacterium translucens* var. *undulosum*) in crosses between the spring wheat variety H–44 (highly resistant to black rust, resistant to brown rust and bunt, and very susceptible to black chaff) as the one parent, and Kota × Marquis No. II–19–167 or Double Cross No. II–21–28, as the other parent, both of which are moderately resistant to black rust, highly resistant to black chaff, susceptible to brown rust, and moderately susceptible to bunt. The results of the experiments, which were made at the University Farm, St. Paul, Minnesota, indicated that inheritance of the mature plant resistance to black rust of the H–44 parent is apparently dependent upon a single genetic factor difference. The moderate resistance of the other two parents appeared to be dependent upon factors not allelomorphic to those of the H-44 type, as susceptible lines were obtained in the F_3 generation. The number of factor pairs responsible for segregation of reaction to brown rust, bunt, and black chaff could not be determined, although a considerable number of resistant types was obtained in all cases. There appeared to be no linkage in the inheritance of reaction to the following combinations of diseases, namely, black rust and bunt, brown rust and bunt, brown rust and black chaff, and black chaff and bunt, but there was evidence of linkage in the inheritance of reaction to black rust and bunt, on the one side, and to black chaff and bunt, on the other. Finally, the results indicated the possibility of combining the mature plant resistance to black rust of the H–44 type with the resistance to black chaff of many varieties and hybrids of common wheat.

GASSNER (G.) & HASSEBRAUK (K.). **Zweijährige Feldversuche über den Einfluss der Düngung auf die Rostanfälligkeit von Getreidepflanzen.** [Two years' field experiments on the influence of manuring on the susceptibility of cereal plants to rust.]—*Phytopath. Zeitschr.*, vii, 1, pp. 53–61, 1934.

The results of field trials fully substantiated those previously obtained by the writers in greenhouse tests [*R.A.M.*, xi, p. 98] as to the promotion of rust (*Puccinia triticina* and *P. glumarum* on wheat, *P. coronifera* [*P. lolii*] on oats, and *P. sorghi* [*P. maydis*] on maize) by nitrogen fertilizers and its suppression by potash [ibid., xiii, p. 83]. It is therefore of the utmost importance to avoid any excess of nitrogen over potash in the manuring scheme.

GASSNER (G.) & HASSEBRAUK (K.). **Der Einfluss der Mineralsalzernährung auf das Anfälligkeitsverhalten der zur Rassen-**

bestimmung von Getreiderosten dienenden Standardsortimente. [The influence of the mineral salt nutrition on the susceptibility relations of the standard varieties serving for the race determination of cereal rusts.]—*Phytopath. Zeitschr.*, vii, 1, pp. 63–72, 1934.

By means of drastic variations in the potash and nitrogen supplies [see preceding abstract] it was possible to induce far-reaching modifications in the reactions of the standard collection of wheats to *Puccinia triticina* form 14 and *P. glumarum* forms 4 and 7, of oats to a Brunswick collection of *P. coronifera* [*P. lolii*: *R.A.M.*, xii, p. 274], and of barley to *P. simplex* [*P. anomala*] form 2 [ibid., xi, p. 36]. Such being the case, it is questionable whether the ordinary procedure of growing the standard varieties for physiologic form determination in field or garden soil gives sufficiently uniform results, or if it may not rather be preferable to grow the plants on a synthetic substratum with a constant nutrient content.

Gassner (G.) & Kirchhoff (H.). **Einige vergleichende Versuche über Verschiebungen der Rostresistenz in Abhängigkeit vom Entwicklungszustand der Getreidepflanzen.** [Some comparative experiments on modifications in rust resistance as conditioned by the state of development of the cereal plants.] —*Phytopath. Zeitschr.*, vii, 1, pp. 43–52, 1934.

Wheat, oats, and barley plants were inoculated throughout the vegetative period with one strain each of *Puccinia triticina* and *P. glumarum* (wheat), *P. coronifera* [*P. lolii*] (oats), and *P. simplex* [*P. anomala*] (barley) in order to determine the applicability to German conditions of the results obtained in the first-named writer's South American experiments on the relation of maturity to reaction to rusts [*R.A.M.*, xi, p. 703].

The experiments on five varieties of wheat with *P. glumarum* form 4 [ibid., xii, p. 272] were only of importance as indicating that the decline of infection in the summer is not due to the increased resistance of older plants. The tests with *P. triticina* form 14 [ibid., xii, p. 274] were confined to older wheat plants, since the young ones succumbed to unfavourable weather and soil conditions. The results confirmed those of the earlier trials in so far as in most varieties the susceptibility of the leaves inserted towards the middle of the stem increased until the time of flowering, while that of the top leaf reached a climax somewhat later. The four varieties of oats and five of barley used in the tests reacted similarly to *P. lolii* and *P. anomala*, respectively, resistance being at its height before tillering. As in the case of *P. triticina* on wheat, the leaves of medium insertion on both oats and barley contract infection by *P. lolii* and *P. anomala*, respectively, before the top one.

Ronsdorf (Liselotte). **Ueber Plasmolyse und Vitalfärbung bei Sporen und jungen Keimschläuchen von Getreiderostpilzen.** [On plasmolysis and vital staining in the spores and young germ-tubes of cereal rust fungi.]—*Phytopath. Zeitschr.*, vii, 1, pp. 31–42, 2 figs., 1934.

The germination of the uredospores of *Puccinia simplex* [*P. ano-*

mala], *P. triticina*, and *P. coronifera* [*P. lolii*] was very severely impaired by continuous immersion in plasmolysing cane sugar solutions (0·9 to 1·3 mol). In calcium chloride solutions (0·6 to 0·8 mol.) *P. glumarum* was killed and the development of *P. anomala*, *P. dispersa* [*P. secalina*], *P. graminis*, and *P. triticina* impeded, *P. lolii*, however, being unaffected. Calcium chloride appears to penetrate the germ-tubes and spores of the rusts more rapidly than cane sugar, judging by the higher values (based on a calculation of pressure in atmospheres) for the former in the plasmolysis tests. A comparison of the osmotic values of the germ-tubes of *P. anomala* with those of the host cells in inoculated barley plants showed that that of the parasite was considerably higher [cf. *R.A.M.*, xii, p. 713]. Vital staining of the spores of *P. anomala* was accomplished with neutral red (1 in 100,000).

Levine (M. N.), Cotter (R. U.), & Stakman (E. C.). **The production of an apparently new variety of Puccinia graminis by hybridization on Barberry.**—Abs. in *Phytopath.*, xxiv, 1, pp. 13–14, 1934.

From artificial greenhouse crosses between certain physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, xii, p. 14] and *P. g. secalis* on barberry arose lines capable of normal infection on barley but not on other cereals and thus apparently representing a new variety of the rust. The crosses were *P. g. secalis* 7 × *P. g. tritici* 2, and *P. g. secalis* 7 × *P. g. tritici* 101, the progeny being similar in both cases. Some evidence is also available that *P. g. tritici* 34 × *P. g. agrostidis* produced a rust similar to the above.

Hanna (W. F.) & Popp (W.). **Bunt infection of spring Wheat by soil-borne spores.**—*Scient. Agric.*, xiv, 5, pp. 257–258, 1934. [French summary on p. 291.]

The results of experiments in 1932–3, conducted on the same lines as in the previous year [*R.A.M.*, xii, p. 751], again showed that the viability in the spring of the wheat bunt spores (*Tilletia tritici*) [*T. caries*] that had overwintered in the soil was considerably reduced as compared to that of the spores in wheat heads left over winter on the surface of the ground. In a special experiment, in which formalin-treated seed of the bunt-susceptible Ceres wheat was sown in the spring on small plots artificially infected in the autumn of 1932 with bunted wheat heads, bunt-balls, and sifted spores, it was shown that some of the spores in all three plots survived the winter, the relative amounts of the bunted ears found in the new crop (45, 29, and 11, respectively) indicating that the spores in bunted ears are more likely to retain their viability through the winter than those that overwinter in direct contact with the soil.

Bodnár (J.) & Terényi (A.). **Zur Biochemie der Brandkrankheiten der Getreidearten. IV. Der Wirkungsmechanismus der Hg-Salze auf die Sporen des Weizensteinbrandes.** [On the biochemistry of the smut diseases of cereals. IV. The

mechanism of the action of Hg-salts on the spores of Wheat bunt.]—*Kisérletügyi Közlemények*, xxxv, pp. 75–86, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 1, p. 11, 1934.]

On a calcium nitrate solution only those mercury methyl-treated wheat bunt [*Tilletia caries*] spores germinate to which no mercury adheres. On damp soil those treated with mercuric acetate also germinated but not those that had been immersed in mercuric chloride or bromide [*R.A.M.*, xi, p. 774]. The effect of the two latter compounds is attributed to the adsorption by the spores, not only of mercury ions, but also of lipoid-soluble molecules which penetrate and destroy them. This does not apply to mercuric acetate, from which only the mercury ions are adsorbed. On account of its greater dissociability mercuric bromide exerts a more potent fungicidal action than mercuric chloride, the former being efficacious at a concentration as low as 0·005 per cent., representing an equivalent of 0·4 per cent. adsorbed mercury. The adsorbed mercury exerts a merely retardatory action on spore growth, similar to but weaker than that produced by copper under like conditions [ibid., x, p. 178]. On the addition of sodium chloride to a mercuric acetate solution, mercuric chloride molecules are formed which penetrate and kill the spores.

Noble (R. J.). **Note on the longevity of spores of the fungus Urocystis tritici Koern.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxvii, pp. 403–410, 1934.

In this progress report of his investigation of the longevity of the spores of flag smut (*Urocystis tritici*) of wheat [*R.A.M.*, iii, p. 577], the author states that spores collected in 1923 in New South Wales and kept in the laboratory under conditions of low relative atmospheric humidity, still germinated vigorously in 1933 [cf. ibid., x, p. 371]. No germination was observed at any time during the intervening interval of ten years in the series of spores that were kept at 72·5 and 89 per cent. relative humidity.

Mains (E. B.). **Inheritance of resistance to powdery mildew, Erysiphe graminis tritici, in Wheat.**—Abs. in *Phytopath.*, xxiv, 1, pp. 14, 1934.

In crosses between the wheat variety Norka C. I. 4377 and Webster, Ceres, Chinese, Kota, Malakoff, Reliance, and Warden, the first-named being resistant and the others susceptible to physiologic form 1 of *Erysiphe graminis tritici* [*R.A.M.*, xii, p. 362], resistance was found to be inherited as a simple dominant factor (3 resistant : 1 susceptible in the F_2 generation). Resistance to mildew in Norka was inherited independently of resistance to physiologic form 3 of leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina* : ibid., xii, p. 499]. The resistance of Red Fern to mildew was also found to be inherited as a simple, dominant Mendelian factor. The resistance to mildew of Hope C. I. 8178, in crosses with the susceptible Chinese, Marquis, Michigan Amber, and Reliance varieties, was inherited as a simple, recessive Mendelian factor (1 resistant: 3 susceptible in the F_2). In crosses with

Chinese the resistance to mildew of Sonora and of Michigan Amber 29–1–1–1 were also each inherited as a simple, recessive factor.

Weigert (J.) & Weizel (H.). **Über das Auftreten der Fusskrankheiten bei Getreide, vor allem bei Winterweizen, unter besonderer Berücksichtigung des Einflusses der Vorfrüchte.** [On the occurrence of foot rots in cereals, especially winter Wheat, with special reference to the influence of the preceding crops.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 11, pp. 249–261, 4 figs., 1934.

After summarizing the available information on the control of cereal foot rots, caused mainly by *Cercosporella herpotrichoides* and *Ophiobolus graminis* in Germany [*R.A.M.*, xiii, p. 154], the writers give an account of their observations on the attacks of these fungi in Bavaria.

The cultivation of wheat has only recently become practicable on the very poor, gravelly, loamy sand of the Garching heath near Munich through the application of sludge from the municipal plant. One of two adjacent plots on this land gave a very good yield in 1933, whereas on the other the crop was a total failure owing to early infection by *O. graminis*. The former plot was sown in October, 1932, and received sludge, basic slag, and kainit; the preceding crops were rye interspersed with black medick [*Medicago lupulina*] (1931) and oats (1932), to which a green manure was given. The diseased plot was sown in September, 1932, and received sludge and kainit; the preceding crops in 1929, 1930, 1931, and 1932 were potatoes, summer barley, winter rye, and winter barley, respectively, manured with calcium cyanamide, basic slag, and kainit. The cause of the trouble was evidently the repeated sequence of cereals, with winter barley as the immediately preceding crop, the very early date of sowing being possibly also a contributory factor.

On the experimental farm at Nederling, where the composition of the soil is similar to the foregoing, trials on the effects of fertilizers on the incidence of foot rot in winter rye and wheat alternating with potatoes have been in progress since 1921. *C. herpotrichoides* (predominantly associated with lodging) was definitely more severe on the rye plots manured exclusively with nitrogen or with phosphorus and nitrogen (no potash) than on any of the others, this being in accordance with most recorded observations. There was no apparent increase of infection on the potash-nitrogen plots (no phosphorus) or on those receiving the complete fertilizer with the addition of calcium. Neither in these trials nor in a permanent phosphoric acid series (since 1922) has any evidence been obtained of an increase of foot rot as a result of phosphorus deficiency. Wheat on the experimental farm was chiefly affected by blackleg (*O. graminis*), the incidence of which was not increased by nitrogenous manures. In another test with Tassilo wheat receiving a complete fertilization the highest incidence of blackleg occurred in the plots preceded by summer wheat (99 per cent.) and barley 85 per cent.), the corresponding figures for maize, oats, and broad beans [*Vicia faba*] being 1. 1·3, and 1 per cent., respectively.

The practical bearing of these observations on the system of crop rotation is briefly discussed.

No reduction of foot rot in wheat was effected by deep ploughing under (down to 20 cm.) of the stubble of the preceding barley crop.

SPRAGUE (R. A.). **The relative importance of Cercosporella herpotrichoides and of Leptosphaeria herpotrichoides as parasites of winter cereals.**—*Phytopath.*, xxiv, 2, pp. 167–168, 1934.

In the mycological collections of the Bureau of Plant Industry *Cercosporella herpotrichoides* is stated to occur on specimens of diseased wheat collected in Norway by E. Bachala and E. C. Stakman and labelled *Leptosphaeria herpotrichoides* [*R.A.M.*, xiii, p. 297]. From conversation with Dr. O. Aamodt, University of Alberta, who has seen the strawbreaker foot rot in Sweden, it appears that the symptoms of the disease in that country are practically identical with those in the United States [ibid., x, p. 719]. *C. herpotrichoides* is an active parasite, while inoculation experiments with pure cultures of *L. herpotrichoides* from France and Canada revealed its weakness as a pathogen. In the writer's opinion, *C. herpotrichoides* is responsible for most of the damage to wheat attributed to *L. herpotrichoides* in Europe.

GARRETT (S. D.). **Factors affecting the severity of take-all.**—*Journ. Dept. Agric. S. Australia*, xxxvii, 6, pp. 664–674, 1 fig., 1 graph, 1934.

Epidemics of wheat take-all (*Ophiobolus graminis*) in South Australia are mostly confined to the light, sandy soils of the 'mallee' and west coast areas during the first twenty or thirty years of cultivation; on older soils of this type and on the heavier clay-loam of the Adelaide Plains severe outbreaks occur only under exceptional conditions, such as follow the ploughing-in of infected grass or stubble.

Field and laboratory tests [which are fully described] demonstrated that infection occurs much more rapidly in lighter than in heavier soils, but the difference in the rate of growth of the fungus in the two classes of soil was completely eliminated by soil sterilization, definite evidence being obtained that the retardation of infection noted in the heavy soils was due to micro-organisms which impeded the external spread of the hyphae along the roots, not to the resistance of the wheat plants. Infection was inversely related to the bacterial numbers in the soils tested. Any measures which increase the organic content of the light, sandy soils should decrease infection correspondingly.

A quantitative method for the estimation of infection by *O. graminis* under different soil conditions by the direct measurement of the growth rate of the runner hyphae along the roots of wheat seedlings is described. Further investigations are in progress.

YOUNG (P. A.). **Sclerotium blight destroys winter Wheat in Gallatin County, Montana.**—Abs. in *Phytopath.*, xxiv, 1, p. 21, 1934.

In April, 1932 and 1933, numerous sclerotia, apparently of

Sclerotium fulvum, were found on the straw of Turkey wheat and on dead stems of *Sisymbrium altissimum* in Montana. The disease due to this fungus was confined to land on which *Sclerotium*-killed wheat leaves were collected at the same time and in the preceding year [cf. *R.A.M.*, xiii, p. 223]. On maize meal agar at 5° C. the sclerotia from overwintered wheat and *Sisymbrium* stems produced sparse, hyaline hyphae and numerous reddish-brown sclerotia, 700 to 1,200 μ in diameter (200 to 900 μ when dry). On the melting of the snow from infested fields, white, tan, or grey, unshrivelled wheat leaves were seen to be flattened against the soil; they had been killed by *S. fulvum* and bore a number of reddish-brown to black sclerotia, 200 to 500 μ in diameter. Plants surviving winter blight developed pale heads with shrivelled grain. No resistance to spontaneous infection was shown by 40 wheat varieties, but autumn-sown seed, emerging in the spring, escaped the disease.

Stanton (T. R.), Murphy (H. C.), Coffman (F. A.), & Humphrey (H. B.). **Development of Oats resistant to smuts and rusts.** —*Phytopath.*, xxiv, 2, pp. 165–167, 1934.

Very promising results in the development of oats strains combining resistance to stem [black] rust (*Puccinia graminis avenae*), crown rust (*P. coronata avenae*) [*P. lolii*: *R.A.M.*, xiii, p. 156], and loose and covered smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) have been obtained in the writers' recent experiments at Ames, Iowa, with crosses between Victoria and Richland [ibid., xiii, p. 296]. The F_3 progeny were exposed to both greenhouse and field epidemics of the rusts and smuts with highly satisfactory results as regards resistance, but their productivity and adaptability to agricultural conditions require further testing.

Sprague (R.). **A physiologic form of Septoria tritici on Oats.**— *Phytopath.*, xxiv, 2, pp. 133–143, 2 figs., 1934.

Winter Turf and Red Rustproof oats growing in an acid soil in the Alsea River Valley, Oregon, were severely attacked in 1930 to 1932 by a leaf spot due to a *Septoria*, closely similar to one also found on *Holcus lanatus* in the vicinity. The lesions on oat leaves and sheaths are grey, irregular or rectangular, and sometimes bordered by greenish-yellow areas. The prominent, subepidermal and substomatal, subglobose to globose or ellipsoid, amber-brown to black-walled pycnidia measure 60 to 145 by 40 to 100 μ (average 95 by 74 μ) and exude short, pale flesh-coloured cirrhi of cylindrical, hyaline, 1- to 7-septate pycnospores, 35 to 120 by 1·6 to 3·5 μ (70 by 2·2 μ). The hyphae within the host cells are yellow to olive-brown and average 2 μ in diameter.

The slender spores of the fungus and its slow, yeast-like growth in pure culture on potato-dextrose agar differentiate it from *Leptosphaeria avenaria* Weber (*S. avenae* Frank) [*R.A.M.*, ix, pp. 225, 625] and indicate a close relationship with *S. tritici* Desm. [ibid., ii, p. 212], of which it is accordingly considered to be a physiologic form synonymous with *S. graminum* var. *C. avenae* Desm. The form on oats did not infect wheat, barley, or rye in inoculation

tests, while the form or forms on wheat have not been observed on oats.

Stakman (E. C.), Moore (M. B.), & Cassell (R. C.). **The pathogenicity and cytology of Urocystis occulta.**—Abs. in *Phytopath.*, xxiv, 1, p. 18, 1934.

At soil temperatures of 14°, 19°, 24°, and 29° C. the following flag smut (*Urocystis occulta*) [*R.A.M.*, xii, p. 751] percentages developed in rye plants from inoculated seed: 47, 35, 24, and 0, respectively. The 139 selfed lines of rye tested for smut reaction under Minnesota conditions ranged from highly resistant to completely susceptible. No conclusive evidence of physiologic specialization was obtained from the inoculation of eight rye varieties with five collections of *U. occulta*. The spores produce a promycelium on which are formed two to six uninucleate sporidia. Fusion of sporidia on the same or different promycelia is effected in various ways, giving rise to binucleate hyphae of the dikaryophase. Within the host the vegetative hyphae appear predominantly binucleate, the diplophase resulting from nuclear fusions in the spore-mother cells.

Beck (E. C.). **The precipitin ring test applied to some Ustilaginaceae.**—*Canadian Journ. of Res.*, x, 2, pp. 234–238, 1934.

The standard precipitin ring test [*R.A.M.*, xiii, p. 117] was applied [by methods which are detailed] with a view to the differentiation of the following smut fungi: (1) monosporidial cultures of *Sorosporium reilianum* [ibid., xii, p. 563], *Ustilago hordei*, *U. levis* [*U. kolleri*], and *U. zeae* from Minnesota, and (2) mass cultures of *U. hypodytes* (Schlecht.) Fr. from *Agropyron repens* [ibid., ix, p. 459], *U. tritici*, *U. avenae*, *U. kolleri*, and *U. zeae*, all isolated in Ontario.

The results [which are tabulated] indicated that the monosporidial cultures can be satisfactorily differentiated by testing with the serum of rabbits inoculated with the ground cultures filtered after extraction with 0·85 per cent. sodium chloride. Although they were frequently mutually reactive in undiluted serum-antigen mixtures, their specificity was apparent in the persistence of the precipitin ring at stronger dilutions with homologous than with heterologous mixtures. With mass cultures the technique was less successful, numerous cross reactions being shown. It was found that closely related species and physiologic forms are not easily differentiated since characters common to two or more of them apparently tend to mask their differences. The precipitin ring test, however, does offer possibilities of determining the closer affinities among groups of doubtful species or genera.

Smith (G. M.) & Trost (J. F.). **Diplodia ear rot in inbred and hybrid strains of sweet Corn.**—*Phytopath.*, xxiv, 2, pp. 151–157, 1 fig., 1 graph, 1934.

Little difference was observed between Dent and sweet maize as regards natural infection by *Diplodia zeae* [*R.A.M.*, xiii, p. 218], recognized to be the most serious cause of maize ear rot in the United States, in trials with a large number of strains under

conditions favouring the disease in Indiana. No marked correlation was found, moreover, between the percentage of infected ears in the inbred strains of sweet maize used as parents and that in the F_1 crosses between them. The results of the experiments [which are tabulated and briefly discussed] indicate that the losses due to *D. zeae* may be reduced to some extent by breeding and selection for resistance, the most striking response to which was shown by the Country Gentleman strains, with a reduction from 18·5 to 3·5 per cent., and the least by Golden Bantam (8·3 to 7·5), during the first five years' tests.

TAKASUGI (H.) & AKAISHI (Y.). **Studies of the downy mildew (Sclerospora graminicola setariae-italicae) on Italian Millet in Manchuria. I, about the germination of the oospores.**—*S. Manchuria Ry. Co. Agric. Exper. Stat. Res. Bull.* 11, pp. 1–20, 8 pl., 1933. [Japanese, with English abstract. Abs. in *Exper. Stat. Record*, lxx, 4, pp. 489–490, 1934.]

Field investigations in 15 districts of Manchuria from 1927 to 1929 revealed 10 to 25 per cent. damage to Italian millet (*Setaria italica*) by downy mildew (*Sclerospora graminicola*) [*R.A.M.*, xii, p. 623], the oospores of which have been found to remain viable for over eight years. The following fungicides proved toxic to these spores: tillantin, uspulun, semesan, mercuric chloride, copper sulphate, and formalin, and they were also killed by the hot-water treatment. Field experiments demonstrated the value of crop rotation and seed disinfection in the control of the disease.

TAKASUGI (H.) & AKAISHI (Y.). **Studies on the smuts of Sorghums. I, germination of spores of the loose kernel smut (Sphacelotheca cruenta) of Sorghum.**—*S. Manchuria Ry. Co. Agric. Exper. Stat. Res. Bull.* 11, pp. 21–60, 9 pl., 1933. [Japanese, with English abstract. Abs. in *Exper. Stat. Record*, lxx, 4, p. 492, 1934.]

Sorghum in Manchuria was found to be damaged to the extent of 20 or 30 per cent. by *Sphacelotheca cruenta*, *S. sorghi* [*R.A.M.*, xiii, p. 227], and *Sorosporium reilianum* [ibid., xii, p. 617]. The spores of *S. cruenta* were found to reach maturity in about 17 days from the time the diseased head breaks out from the leaf sheath. In the laboratory the spores retained their viability for four years, but those from infected heads kept on and in the soil out of doors did not survive the winter. The optimum temperature for germination was found to be 25° C., with a minimum above 12° and a maximum under 43°. Good control was obtained by seed-grain disinfection with formalin, copper sulphate, semesan, uspulun, tillantin, or lime-sulphur, as well as by the hot-water treatment.

CARRERA (C.). **Informe preliminar sobre una enfermedad nueva comprobada en los Citrus de Bella Vista (Corrientes).** [A preliminary note on a new disease observed among the Citrus plantings of Bella Vista (Corrientes).]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxiv, 2–3, pp. 275–280, 4 figs., 1933. [Received April, 1934.]

In 1933 the writer investigated a root rot affecting up to 75 per

cent. of the trees in the Bella Vista (Corrientes) citrus plantings. The first symptom of the disease is the gradual yellowing of the leaves of the terminal shoots, which subsequently shrivel and rapidly fall. The shoots wither and assume a whitish colour; on their surface appear large quantities of acervuli of *Colletotrichum gloeosporioides*. The leaf fall proceeds from above downwards and from the periphery to the centre of the tree; the fruits beginning to form remain small and yellow, shrivelling and falling in large numbers. On removing the cortex at the base of the tree a mouldy smell is evident. The diseased roots, down to the smallest, are abnormally dark-coloured and shrunken, the fragile, cracked bark readily peeling off. Intra- and intercellular hyaline, septate hyphae of regular diameter occur in the cortex down to the cambium, and sometimes in the medullary rays of the wood. Inoculation experiments are in progress with various species of *Fusarium* isolated from the diseased roots.

The infected plantings are situated on sandy soils, poor in nutrient substances, of acid reaction, and having a shallow, impermeable subsoil. Cultural methods are defective. The root rot appears chiefly to affect bitter oranges (*Citrus aurantium*) [var. *bigaradia*], limes (*C. aurantifolia*) remaining immune even when surrounded by diseased trees, while neither lemons nor grape-fruit are known to contract infection. Control measures should be based on the eradication and destruction of diseased material, disinfection of wounds, and improved cultivation and drainage.

Among other diseases observed during the writer's visit of inspection were eruptive leprosy (*Amylorosa aurantiorum*) [*R.A.M.*, x, p. 24], foot rot (*Phytophthora terrestris*) [*P. parasitica*], scab (*Sphaceloma fawcettii*) [ibid., xiii, p. 386], anthracnose (*Colletotrichum gloeosporioides*), melanose (*Phomopsis*) [*Diaporthe citri*: ibid., xiii, p. 26], and foliar gummosis [ibid., x, p. 25; xii, p. 760]. Bacteria were isolated in large numbers from lesions resembling those caused by *Bacterium* [*Pseudomonas*] *citri* [ibid., xi, p. 415], but inoculation experiments with the organisms gave negative results.

Van der Plank (J. E.). **Sooty blotch on Citrus fruits.**—*S. Africa Dept. of Agric. Sci. Bull.* 121, 12 pp., 2 figs., 1933. [Received April, 1934.]

This is an expanded account of the writer's studies on the symptomatology, distribution, and control of sooty blotch of citrus (*Gloeodes pomigena*) in South Africa, a note on which has already been published [*R.A.M.*, xii, p. 759]. The disease is troublesome in places and is possibly on the increase, no variety of citrus being immune. Besides the treatment with bleaching powder (chloride of lime) experiments are in progress for the prevention of infection by spraying with lime-sulphur. It is stated that fly speck of citrus (*Leptothyrium pomi*) also occurs in South Africa, but is rare.

Thompson (D. J.). **Develop method for using zinc for brown rot gummosis.**—*California Citrograph*, xix, 3, p. 65, 1 fig., 1934.

Very satisfactory results in preventing the onset of brown rot gummosis [*Phytophthora citrophthora*: *R.A.M.*, xiii, p. 301] until after the susceptible stage had passed were obtained on over 16,000

young lemon trees budded on sweet orange stock in California by placing a band of cheap, durable building paper round the trunk, exposing the crown roots so that the paper (which extended up to the bud union but is expected to be more effective if made high enough to reach above the latter) rested on them, and filling the cavity between the trunk and the paper with a mixture of 25 per cent. each of zinc sulphate (containing 25 per cent. zinc) and hydrated lime and 50 per cent. sand. The average cost was 5 to 6 cents for each tree. Next season the filling will probably consist of 40 per cent. each of zinc sulphate and sand and 20 per cent. hydrated lime.

Reed (H. S.) & Dufrénoy (J.). **Effets de l'affection dite 'mottle leaf' sur la structure cellulaire des Citrus.** [Effect of the so-called 'mottle leaf' disease on the cytological structure of Citrus trees.]—*Rev. Gén. de Botanique*, xlvi, 541, pp. 33-44, 10 figs., 1934.

An account is given of the authors' comparative studies of the cytological structure of the terminal buds of healthy citrus shoots and of shoots affected with mottle leaf [*R.A.M.*, xi, p. 570]. The results showed that in cells affected with mottle leaf, the volume of the cytoplasm is very considerably reduced; the chromidia and the few primordia of chloroplasts tend to aggregate at one pole of the cell along strands of cytoplasm which include small vacuoles, while a large vacuole, surrounded by a thin wall of cytoplasm, occupies the rest of the cell. The palisade cells of the leaf have a feeble photosynthetic activity owing to their deficiency in plastids, while those of the spongy parenchyma contain an accumulation of starch which is not depleted when the leaf is placed in darkness and which seems to be the result of a storage of starch formed in the normal green tissues outside the affected areas and incapable of being utilized by the affected cells.

Afzal (M.). **A note on a growth abnormality of Punjab-American Cottons.**—*Indian Journ. Agric. Sci.*, iii, 5, p. 933, 1933. [Received May, 1934.]

A brief account is given of the symptoms of a growth abnormality, apparently of the nature of a virus disease, which was first noticed in 1930 on American varieties of cotton grown in the Canal Colonies of the Punjab, and which again reappeared with considerably intensified severity in 1932. The trouble is stated to be similar to Cook's 'stenosis' of cotton in Haiti [*R.A.M.*, iii, p. 272], and is characterized by an extreme stunting of the aerial organs of the host. The leaves are crinkled, deformed, with yellowish patches giving them a distinctive mosaic appearance, and the number of the leaf lobes is reduced. The stipules are usually of normal size but very light in colour. The epicalyx is discoloured but not deformed. A large proportion of the developing buds and young bolls on the diseased plants are shed, and the few bolls which are formed are very small and contain few viable seeds. A direct relationship was also noticed between the degree of severity of attack on the aerial organs and the size of the root system. The disease first appears in the field when the plants are six

weeks old, and is stated to be particularly virulent during August. Indigenous cottons seem to be entirely immune from the disease.

MARCHIONATTO (J. B.). **Parasitos vegetales de la langosta.** [Vegetable parasites of the locust.] *ex* **Parasitos más importantes de la langosta ('Schistocerca paranensis' Burm.).** [The most important parasites of the locust (*Schistocerca paranensis* Burm.)]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxiv, 2–3, pp. 227–245, 4 col. pl., 6 figs., 1933. [Received April, 1934.]

Notes are given on the pathogenicity, life-history, and taxonomy of the following parasites of the locust (*Schistocerca paranensis*) in the Argentine Republic: *Coccobacillus acridiorum* d'Hérelle, *Sporotrichum paranense* n. sp. [*R.A.M.*, xiii, p. 302], and *Fusarium* sp.

The most conspicuous symptom of infection by *S. paranense* is the vivid red colour of recently dead insects, which later assume a nacreous-white tinge and become mummified. The internal organs develop a profuse greenish efflorescence consisting of the reproductive bodies of the fungus and visible through the body wall. *S. paranense* is readily cultivable on a number of standard media, on which it forms pulverulent, emerald-green colonies surrounded by a sparse zone of white mycelium. The latter is composed of hyaline, septate, very slender hyphae (2 to 2·5 μ), thickening with age and anastomosing; the short, sparsely branched, more or less clavulate conidiophores bear at their apices cylindrical to ellipsoid or ovoid, greenish-yellow, acrogenous conidia, occurring singly or in chains and germinating by means of two or three germ-tubes. Details are given of a number of inoculation experiments from which it appeared that the first symptoms may develop in three or four days and death in from eight to ten days after inoculation. It was impossible to ascertain the exact mode of infection.

S. paranense ('the fungus of Caracaná') is stated to have been originally detected in 1897 by L. Bruner, who recognized it as a *Sporotrichum* but was unable to furnish a specific name (*Bol. Agric. Gan.*, iii, p. 1088, 1903). Specimens submitted to Spegazzini were identified as *S. globuliferum* (R. J. Huergo: *Informe An. Ofic. Nac. Agric.*, iv, p. 54, 1898), a determination which was later shown to be incorrect.

A species of *Fusarium* allied to *F. acridiorum* [ibid., viii, p. 380] was found covering the eggs with a white, cottony, septate mycelium. The fungus developed well on standard media, producing uni- or bi-cellular, fusoid, slightly curved, hyaline microconidia, 15 to 18 by 3·5 to 4 μ, and fusoid, curved, hyaline macroconidia, often triseptate, with a short pedicel, measuring 30 to 40 by 3·8 to 4 μ. The affected eggs eventually acquire a waxy consistency.

MÜLLER (W.). **Untersuchungen über die Symbiose von Tieren mit Pilzen und Bakterien. III. Mitteilung. Über die Pilzsymbiose holzfressender Insektenlarven.** [Studies on the symbiosis of animals with fungi and bacteria. Note III. On the fungal symbiosis of wood-devouring insect larvae.]—*Arch. für Mikrobiol.*, v, 1, pp. 84–147, 29 figs., 2 graphs, 1934.

A comprehensive account is given of the writer's studies at the

Karlsruhe Technical College on fungal symbiosis in a number of wood-devouring insect larvae.

The symbionts of *Ernobius abietis*, *E. mollis*, *Rhagium bifasciatum*, *R. inquisitor*, *R. mordax*, and *Leptura rubra* are Pseudosaccharomycetes, whereas that of *Sirex gigas* formed in pure culture a typical Hymenomycetous mycelium with clamp-connexions, though fruit bodies were not produced. The microflora of the intestinal tract and feeding galleries of the insects examined consisted largely of green species of *Penicillium*, though several other genera were also represented.

Buchner's assumption that the fungal symbionts assist in the ingestion of wood by the insects [*R.A.M.*, vii, p. 511] could not be verified in the writer's investigations. Pending further research, the function of the fungal associates of the wood-inhabiting Anobiidae and Cerambycidae may be interpreted as a very weak, regular, hereditary parasitism. No definite statement is possible at this stage regarding the nature of the phenomenon in *S. gigas*, but there seems little probability that the insect acts as a breeding ground for fungi as in the case of the ambrosia beetles.

A bibliography of 55 titles is appended.

Fyg (W.). **Beitrag zur Kenntnis der sog. 'Eischwarzsucht' der Bienenkönigin (Apis mellifica L. ♀).** [A contribution to the knowledge of the so-called 'egg melanosis' of the queen bee (*Apis mellifica* L. ♀).]—*Landw. Jahrb. der Schweiz*, xlviii, 1, pp. 65–94, 32 figs., 1934. [French and Italian summaries.]

After summarizing the literature on 'egg melanosis' in the queen bee (a condition characterized by the progressive conversion of the contents of the ovarian duct into yellowish-brown to brownish-black masses, ending in sterility), and describing the normal anatomy and histology of the organs affected, the writer gives a detailed account of his investigations on the disease at the Federal Dairy and Bacteriological Institute, Liebefeld, Berne.

Of the three queen bees exhaustively examined, one showed a diseased condition of the ovaries and rectum, which were occupied by brown or black masses, while many of the ovarioles were abnormally small and with few or no egg origins, and small yeast-like bodies occurred in the epithelial tissues of the egg sacs and ducts and of the rectum, but not within the eggs themselves. The same disease in the second (unfertilized) queen was localized in the venom bladder of the sting, while in the third case the reproductive organs contained the same brownish-black masses as in the first case but no trace of the yeast-like cells in the epithelial tissues was detected. The dark-coloured masses are of two types, viz., small, and compact or cyst-like, the latter consisting of a finely granular substance surrounded by a black, tuberculate crust. The granular substance is composed of polymorphic, elliptical (2·5 to 3·5 by 1·2 to 2 μ) or rod-shaped (3·5 to 5·6 by 0·8 to 1·2 μ) structures, frequently containing 1 or 2 nuclear bodies. Many of the structures show a tendency to yeast-like budding. The brown to black marginal zone is often occupied by larger bodies (2·8 to 4·8 by 1·6 to 2·8 μ) in process of envelopment by a thick, yellowish-brown membrane, the gradual agglomeration of which appears ultimately

to produce the typical dark masses associated with the diseased organs. These are considered to be merely later stages of the yeast-like isolated bodies observed in the epithelial tissues. It can hardly be doubted that the foregoing are phases in the life-history of a fungous parasite, further weight being lent to this supposition by the Gram-positive reaction of the bodies and their active penetration of the tissues. Moreover, hyphal forms were observed in the rectum of the first of the above-mentioned bees which are strongly reminiscent of certain species of *Oidium* or *Monilia*.

Discussing the terminology of the disease, the writer suggests the discontinuance of the word 'egg' as a prefix to melanosis, the condition being by no means restricted to the reproductive system and the eggs themselves showing no evidence of involvement. The use of the German equivalent 'Schwarzsucht' is inadvisable owing to the risk of confusion with another disease of bees. Of the various possible channels of infection, the rectum appears to be the most probable, and there seems to be no reason why the workers should not also contract the disease and act as carriers of the fungus to the queen while supplying the latter with nutriment.

Wachowiak (M.), Marr (J.), Hagebusch (O. E.), Randall (W. A.), & Fleisher (M. S.). **Differentiation of various strains of Monilia by cultural methods.**—*Journ. Infect. Dis.*, liv, 1, pp. 35–44, 1934.

The writers' study, since 1921, of the validity of fermentative activity in the Moniliae as a basis for specific differentiation showed that the irregularities in the action of the 92 strains of *Monilia* (isolated from the human body) under observation on the carbohydrate media tested were so great that this method for specific differentiation seems scarcely justifiable [cf. *R.A.M.*, xii, p. 568; xiii, p. 370].

Other criteria examined for this purpose with unsatisfactory results were the appearance of the growth on solid media, the development of top or bottom growth in fluid ones, the morphology of the stained organisms, and the formation of outgrowths or the type of outgrowths from plate colonies.

Langeron (M.). **Mycose oculaire primitive due au 'Beauveria brumpti'.** [Primary ocular mycosis due to *Beauveria brumpti*.] —*Bull. Acad. Méd.*, cxi, 3, pp. 133–137, 1934.

Beauveria brumpti n. sp. is the name given to a fungus isolated from a case of kerato-conjunctivitis in a 17-year-old European girl resident in Cairo. The farinaceous consistency of the colonies and their pink coloration (in addition to morphological characters to be discussed elsewhere) sufficiently differentiate the new species from the known entomogenous species of the genus. This is believed to be the first authenticated case on record of a *Beauveria* as a human pathogen.

Hoogland (H. J. M.). **Mucormycose bij een varken.** [*Mucor* mycosis in a pig.]—*Tijdschr. Diergeneesk.*, lix, pp. 1156–1163, 1932. [Abs. in *Veter. Bull.*, iv, 4, pp. 220–221, 1934.]

The liver and kidneys of a three-months-old slaughtered pig

examined at the Utrecht University Pathological Institute were found to contain scattered nodular areas, 2 to 2·5 cm. in diameter, a few haemorrhagic infarcts being also present in the kidneys. Microscopic inspection revealed *Mucor* infection in the inflammatory areas of both organs [cf. *R.A.M.*, xiii, p. 238], the mycelium of the fungus being detected in the blood-vessels, larger bile ducts of the liver, and glomeruli and tubules of the kidneys [see next abstract].

Baudet (E. A. R. F.). **Mucor pusillus Lindt als oorzaak van mycose bij het varken.** [*Mucor pusillus* Lindt as the cause of mycosis in the pig.]—*Tijdschr. Diergeneesk.*, lix, pp. 1163–1164, 2 pl., 1932. [Abs. in *Veter. Bull.*, iv, 4, pp. 220–221, 1934.]

The fungus isolated from the liver and kidneys of the pig referred to in the preceding abstract was identified as *Mucor pusillus* Lindt [*R.A.M.*, xii, p. 693 ; xiii, p. 238]. A rabbit injected intravenously with 0·5 c.c. of a 14-day-old culture died within five days, and a post-mortem examination of the kidneys disclosed multiple minute areas occupied by mycelium.

Haines (R. B.) & Smith (E. C.). **The storage of meat in small refrigerators.**—*Dept. Sci. & Indus. Res. Food Invest. Board, Special Rept.* 43, 30 pp., 1 fig., 9 graphs, 1933. [Received May, 1934.]

Studies [which are fully described] made at the Low Temperature Research Station, Cambridge, of the fungal and bacterial spoilage occurring on meat stored in small refrigerators showed that stickiness may result not only from the slime caused by organisms of the *Achromobacter* group, but also from persistent mould growth. Although a certain amount of mould may accompany a slime, if *Achromobacter* multiplies rapidly mould growth is largely inhibited on the lean, while still taking place on the fat. The fungus most commonly present on meat under the conditions tested is *Thamnidium chaetocladioides* [*R.A.M.*, xi, p. 574]. Moulds and bacteria impart different characteristic flavours to lean meat, some persons objecting to the taint of *Thamnidium* but tolerating that of *Achromobacter*, and vice versa. The moulds liable to be deposited on the carcasses in the slaughter-house are mostly *Thamnidium* or *Penicillium* spp., and the bacteria almost invariably of the *Pseudomonas* and *Achromobacter* groups [ibid., xiii, p. 304]. In connexion with the development of slime in joints hung at various temperatures, Smith and Tomkins are stated to have ascertained that the storage life of lean meat heavily inoculated with spores of *Thamnidium* was eight to ten days at 0° C., though stickiness might result in about three days at this temperature if the meat was inoculated with vegetative hyphae. The moulds commonly found on meat, i.e., *Cladosporium herbarum*, *T. chaetocladioides*, *T. elegans*, *Sporotrichum carnis* [ibid., xi, p. 199], *Dematium pullulans*, *Penicillium* sp., and *Mucor mucedo* have, in general, an optimum temperature for germination and growth of about 20° ; reducing the storage temperature to 0° would ensure a storage life for meat exposed to infection by moulds two and a half to three times as long as that resulting from storage at 5°. As the

average storage temperature possible in commercial practice is a few degrees above 0° every effort should be made to keep contamination in the slaughter-house as low as possible.

Notes are also given on tests with various chemicals for the prevention of decay, none of which was found likely to be a substitute for clean and careful handling.

VERNON (T. R.). **The deterioration of dairy-produce by moulds.**—*New Zealand Journ. of Sci. & Techn.*, xv, 4, pp. 237–247, 5 figs., 1934.

The writer describes the results of his examination over a period of one year of New Zealand butter and cheese on arrival in London. Common contaminants of the former (in order of prevalence) [cf. *R.A.M.*, xiii, p. 97] are *Penicillium* spp., *Oospora lactis*, *Phoma* spp., *Fusarium* spp., *Cladosporium herbarum*, *Aspergillus* spp., *Trichoderma lignorum*, *T. roseum*, *Sporotrichum carnis*, and *Scopulariopsis brevicaulis* var. *glabra*. *C. herbarum* is the principal agent of internal spotting, but appeared in only 10 of the 280 samples examined. *Phoma* spp. and a species of *Alternaria* caused large, spreading, muddy-brown blemishes, *F. culmorum* was twice associated with an extensive bright reddish area, while *Penicillium* and *Aspergillus* spp. are the agents of green surface growths.

The most important source of infection is thought to be the condensation water accumulating on boxes of butter after removal from cold storage. As a rule, the temperature conditions obtaining in transport and storage are sufficiently low to prevent fungal development, but on removal from storage after four months the moulds are capable of almost immediate resumption of growth. Glycerine and salt are frequently used to treat parchment wrappers for Australian and Danish butters, respectively; both were found (contrary to expectation in the case of salt) to increase susceptibility to mould infection [cf. ibid., xi, p. 716].

Internal discoloration of butter due to *C. herbarum* was found to affect only unsalted or slightly salted samples, the contamination of which takes place during manufacture. The defect develops on unsalted butter within four to six days after removal from storage under favourable conditions, in slightly salted within six to ten. It would take three weeks to appear in the salted product, which is consumed before this time.

P. roqueforti [ibid., viii, p. 676] was consistently isolated from moulded cheese, infection taking place through crevices below the crown. No definite evidence is forthcoming for the assertion that fungi are responsible for the bluish-black, muddy, pink, and bleached areas recently observed on annatto coloured cheese [ibid., xii, p. 696].

OCFEMIA (G. O.) & BUHAY (G. G.). **Bunchy-top of Abacá, or Manila Hemp: II. Further studies on the transmission of the disease and a trial planting of Abacá seedlings in a bunchy-top devastated field.**—*Philipp. Agric.*, xxii, 8, pp. 567–581, 2 figs., 1934.

Bunchy top of abacá (*Musa textilis*) in the Philippines [*R.A.M.*, xi, p. 300] has not been found to occur spontaneously on bananas

(*M. sapientum* and *M. cavendishii*), to which, moreover, it cannot be transmitted by *Pentalonia nigronervosa* [ibid., xiii, p. 111]. The authors' experiments [which are briefly described] are considered to be difficult to explain except on the assumption that the virus of banana bunchy top in Australia is different from that on abacá in the Philippines. Twelve hours was found to be the minimum period required by *P. nigronervosa* for the assimilation of the bunchy top virus from diseased abacá plants and its transmission to healthy abacá seedlings. The virus can cause infection after undergoing an incubation period of 24 to 48 hours within the insect. In fast-growing seedlings the incubation period of the disease is shorter (30 to 32 days) than in slow-growing ones (60 to 72 days). The abacá bunchy top virus is not transmissible to the progeny of viruliferous aphids. Unlike the viruses of the mosaic group, that of bunchy top is not transmissible to healthy abacá plants by the pin-prick method [ibid., ix, p. 678 *et passim*].

In the rehabilitation of an abacá field devastated by bunchy top, the complete removal of all the existing stools is necessary and replanting should not be attempted immediately. The removal of the plants exposes the soil to drying out, the injurious effects of which may be minimized by the use of larger plants and by irrigation during the dry season following the rainy months. Suckers should be obtained exclusively from disease-free regions.

Huber (G. A.) & Jones (L. K.). **The Verticillium disease of Chrysanthemums.**—*Washington Agric. Exper. Stat. Bull.* 290 (*Technical Paper*), 14 pp., 4 pl., 1934.

From wilted greenhouse chrysanthemums in the State of Washington [*R.A.M.*, xi, p. 375] the authors isolated two culturally distinct forms of *Verticillium dahliae*, of which one (No. 14) formed pseudosclerotia, and the other (No. 26) a compact crust, when grown on various media. Both were frequently isolated from the same plant. Greenhouse observations and inoculation tests showed 24 [listed] varieties to be resistant and 9 highly susceptible. Although two varieties showed 100 per cent. susceptibility when inoculated with either form, the disease was much more severe when No. 26 was used. Certain other varieties were attacked by one only of the two forms in inoculation tests and these always yielded the same type in isolations from natural infections.

Passalacqua (T.). **La variegatura patologica del Pelargonium ed altre piante.** [Pathological variegation of *Pelargonium* and other plants.]—*Lavori R. Ist. Bot. di Palermo*, iv, pp. 201–240, 5 pl., 3 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiv, 1–2, p. 71, 1934.]

From spotted leaves of *Pelargonium*, acacia [*Robinia pseud-acacia*], and palms at Palermo the author isolated a bacterium of the *Bacterium barkeri* group [*R.A.M.*, iv, p. 469], inoculations with pure cultures of which produced similar (though not identical) symptoms on previously healthy *Pelargonium* and *R. pseud-acacia* leaves.

Green (D. E.). **Antirrhinum rust. A disease new to Great Britain.**—*Journ. Roy. Hort. Soc.*, lix, 1, pp. 119–126, 2 pl., 1 fig., 1934.

An expanded account is given of the writer's investigations at the Royal Horticultural Society's Garden, Wisley, Surrey, on the symptoms, life-history, and control of *Antirrhinum majus* rust (*Puccinia antirrhini*), recorded for the first time in Great Britain in 1933 [*R.A.M.*, xii, p. 764]. The disease is said to have been discovered in California and Oregon in 1895 and to be considered by growers in the United States to be the most serious disease of antirrhinums grown under glass. As the sporidia borne by germinating teleutospores will not infect the same host it appears that the aecidial stage may occur on some alternate host which is still unknown.

Green (D. E.). **Antirrhinum rust.**—*Gard. Chron.*, xcv, 2458, p. 81, 1 fig., 1934.

There seems to be little doubt that the snapdragon (*Antirrhinum*) [*majus*] rust (*Puccinia antirrhini*), detected for the first time in England in the summer of 1933 [see preceding abstract], is capable of overwintering in its new habitat, since vigorously germinating uredospores were found on the leaves of a batch of seedlings received at the Royal Horticultural Society's Laboratory in the second week of January, 1934. The disease spread rapidly during the past season in south-eastern England, where some 60 cases were reported by the Ministry of Agriculture's Laboratory, and a fresh outbreak in the coming summer may be anticipated. The Ministry of Agriculture recommends soil disinfection with a solution consisting of 1 lb. copper sulphate in 10 galls. of water, while the sulphur dust treatment used by O. Butler in the United States [*R.A.M.*, iii, p. 214] may also be effective in this country, particularly in the greenhouse.

Brown (Nellie A.). **Control of crown and root rot of Paeonies in America.**—*Gard. Chron.*, xcv, 2460, p. 114, 1934.

In this note (reprinted from the *American Paeony Society Bulletin*) the writer states that the immersion of peony roots (after excision of the diseased portions) in hot water (120° F.) for 30 minutes, primarily against the root-knot nematode [*Heterodera marioni*], incidentally gave good control of crown and root rot (caused by several different fungi) [including *Phytophthora paeoniae*: *R.A.M.*, viii, p. 244] and Lemoine's disease [of undetermined origin].

Pape (H.). **Falscher Mehltau an Mohn.** [Downy mildew of Poppy.]—*Gartenwelt*, xxxvii, pp. 289–290, 2 figs., 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 2, p. 32, 1934.]

When ornamental garden varieties of poppy are severely infected by *Peronospora arborescens* [*R.A.M.*, ix, p. 626; xiii, p. 31] they are frequently killed in the cotyledonary leaf stage. Older plants

are stunted, the pedicel being absent or twisted and swollen; collapse ensues on the infection of the stem base. Diseased flower buds fail to open, with the result that their capsules shrivel and the seeds do not germinate. Infection is perpetuated by unduly close planting as well as by the admixture of fragments from the diseased capsules with the seed. Hence it is essential to burn all infected material in the autumn. Copper-containing fungicides do not give adequate control.

McKenny Hughes (A. W.). **Aphides as vectors of 'breaking' in Tulips.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 112–119, 1 pl., 1934.

In this report of his continued investigation of the 'breaking' disease in tulips [*R.A.M.*, x, p. 599], the author distinguishes three types of infection which he terms 'full break' (previously described as 'white break'), 'self break' ('red break'), and 'clotted break', a condition manifested in dark purple or dark red shiny varieties which never show the ordinary bicoloured 'full break', but intensify the self colour in great splashes and patches [ibid., xiii, p. 308]. The results of experiments from 1930 to 1933 [details of which are given] lead him to conclude provisionally that two viruses (possibly identical with those isolated by McWhorter) [ibid., xiii, p. 292] are present in the ordinary 'full break', one of which is selectively transmissible by the aphids *Myzus persicae* and *Macrosiphum gei* to healthy tulips, in which it causes 'self break'. There was no evidence that the second virus was transmitted alone. 'Self break' tulips can only transmit 'self breaking'. It was definitely established that 'parroting' [ibid., x, p. 599] is not transmissible by the aphids, and it is believed to be probably rather a 'sport' than a virus infection. It was also found that *Anuraphis tulipae* is a definite vector of all three types of 'breaking' in the bulb store, but not on the growing plant, and that at a certain stage of growth tulips cease to be susceptible to infection.

McKay (M. B.) & Warner (M. F.). **Historical sketch of Tulip mosaic or breaking. The oldest known plant virus disease.** —*Nat. Hort. Mag.*, xii, 3, pp. 179–216, 14 figs., 1933. [Received May, 1934.]

After a brief reference to recent research work establishing that 'breaking' in tulips is a virus disease [see preceding abstract], the author gives a number of citations from earlier literature dealing with this condition, from which he concludes that the first definite record of 'breaking' in its aspect of variegation of the flowers was published in 1576 by Carolus Clusius. The fact that he based his observations on the collection of Rye of Mechlin, which was started from Turkish bulbs received about 1562, would indicate that the disease was introduced into western Europe from Turkey, where it was probably observed in 1555 or even earlier. The paper also contains some interesting early illustrations of broken varieties, and terminates with a bibliography, arranged chronologically, of the literature cited.

Haasis (F. A.). **Control of the Narcissus leaf-scorch under Long Island conditions.**—Abs. in *Phytopath.*, xxiv, 1, pp. 9–10, 1934.

A considerable reduction in the number of primary leaf scorch (*Stagonospora curtisii*) infections on narcissus [*Narcissus* spp.] on Long Island [*R.A.M.*, xiii, p. 167] is obtained by one hour's immersion of the bulbs in water, followed by a 30-minute dip in mercuric chloride 1 in 750 or formaldehyde 1 in 120 before planting. Secondary infections may be controlled by timely applications (four or five between the first week in May and the third in June) of 4–4–50 Bordeaux mixture or 20-80 copper-lime dust.

Laubert (R.). **Beobachtungen und Fragen über die Biologie des Mahonienrostes.** [Observations and questions on the biology of the *Mahonia* rust.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv, (*Jahrbuch*), pp. 273–275, 1 fig., 1933.

Berberis aquifolium leaves in the writer's garden in a suburb of Berlin were observed, in June, 1933. to bear blood-red spots containing uredospores and a few teleutospores of *Puccinia mirabilissima* [*R.A.M.*, xii, p. 578]. A microscopic examination of the lesions and a comparative microscopic study of the aecidial stage with that of *P. graminis* precluded any possibility of confusion between the two rusts. The aecidia of *P. mirabilissima* evidently arise from sporidia formed during May by the teleutospores on overwintered leaves.

Keur (J. Y.). **Studies of the occurrence and transmission of virus diseases in the genus Abutilon.**—*Bull. Torrey Bot. Club*, lxi, 2, pp. 53–70, 4 pl., 1934.

Some of the results obtained by the writer in his studies at the New York Botanical Garden (1928–32) on the occurrence and transmission of virus diseases in *Abutilon* have already been summarized from another source [*R.A.M.*, xiii, p. 381]. Definite evidence of the transmission of the virus through seeds was obtained. Of the 3,185 seedlings grown, involving all possible combinations of inter-clone pollinations, 461 showed 'variegated' characters. Four of the seedlings tested were capable of transmitting their variegation to *A. regnellii*; these seedlings arose from crosses between *A.* clone *mulleri* and *A.* [*striatum*] clone *thompsoni* [ibid., vii, p. 386; xi, p. 592] neither of which is self-compatible, so that the virus in these clones is transmissible to a small percentage of the offspring. No evidence of insect transmission was obtained.

Previous workers have claimed that the seeds obtained from variegated plants give rise exclusively to green seedlings [loc. cit.]. In the writer's tests this was the case with 969 seedlings grown from seed of *A. regnellii* plants rendered variegated by graft infection. The apparent absence of the virus in the seeds of this species and the low percentage of infected seedlings obtained from the plants mentioned above indicate that the variegation virus is not usually distributed to the embryo, at any rate in an active form.

Evidence of the existence of two types or strains of variegation [loc. cit.] was forthcoming, the form affecting *A. thompsoni*, *A.*

mulleri, *A. megapotamicum variegatum*, and the Eclipse variety being more intense than that occurring in infected garden stock of the New York Botanic Garden.

Grillo (H. V. da S.). **Sobre a Pestalotia rhipsalidis sp. n.** [On *Pestalotia rhipsalidis* sp. n.]—*Arq. Inst. Biol. Veg.*, i, 1, pp. 63–65, 3 figs., 1934.

Portuguese and Latin diagnoses are given of *Pestalotia* [*Pestalozzia*: cf. *R.A.M.*, viii, p. 605] *rhipsalidis*, found producing irregular, epiphyllous or amphigenous, vivid yellow, dark-edged lesions on living joints of the cactus *Rhipsalis pachyptera* in the Botanic Garden, Rio de Janeiro, Brazil. The black, punctiform, globose to lenticular acervuli embedded in the spots, later erumpent, measure 150 to 250 μ in diameter; the 4-septate conidia, straight or slightly curved, measure 22 to 27 by 9 to 11 μ, the intermediate olivaceous loculi 18 to 22 μ; the hyaline apical cell is cylindrical, generally 3-, rarely 2- or 4-ciliate, the divaricate cilia measuring 13 to 27 μ in length, while a hyaline, filiform pedicel, 7 to 11 μ long, remains on the lanceolate basal cell.

Taubenhaus (J. J.) & Ezekiel (W. N.). **Two new diseases of the Texas Bluebell, Eustoma russellianum.**—Abs. in *Phytopath.*, xxiv, 1, p. 19, 1934.

During the last five years the Texas bluebell (*Eustoma russellianum*) has been affected by two diseases of commercial importance, namely, crown rot and damping-off caused by *Fusarium solani* [*R.A.M.*, xii, p. 135], and stem and leaf blight due to *Sclerophoma eustomonis* n. sp. Inoculation experiments with pure cultures of both fungi gave positive results. Insects from diseased plants were found to carry viable spores of both organisms. Soil sterilization with formaldehyde controlled the fusariosis, while the stem blight was combated by spraying with 4–4–50 Bordeaux mixture plus casein as a spreader and nicotine as an insecticide.

Lemesle (R.). **Des divers effets produits par le Fusarium anthophilum (A. Br.) Wr. sur l'ovule de Scabiosa succisa.** [On the different effects produced by *Fusarium anthophilum* (A. Br.) Wr. on the ovule of *Scabiosa succisa*.]—*Comptes rendus Acad. des Sciences*, cxcviii, 1, pp. 117–118, 3 figs., 1934.

The fate of the ovules of *Scabiosa succisa* flowers attacked by *Fusarium anthophilum* [*R.A.M.*, xii, p. 292] was found to be very variable. In some cases the normal structure and fertility may be preserved, but more often the hyphae either penetrate the ovule and replace the constituents of the embryonal sac, or the latter simply remains undifferentiated as a cavity containing not a trace of mycelium. The stamens develop normally and the pollen sacs are well filled.

Cunningham (G. H.). **Orchard sprays in New Zealand. VII. Combination sprays.**—*New Zealand Journ. of Agric.*, xlviii, 1, pp. 1–12, 1934,

In these notes on combination sprays commercially used in New Zealand against pests and diseases of orchard trees [*R.A.M.*, xii,

p. 42] the author states that a spray consisting of 2 lb. colloidal sulphur in 100 galls. of 0·083 per cent. lime-sulphur gives satisfactory control (without scorching) of apple black spot [scab: *Venturia inaequalis*: ibid., xii, p. 296] and powdery mildew [*Podosphaera leucotricha*: ibid., xi, p. 604] as well as of leaf rust and brown rot of stone fruits [*Puccinia pruni-spinosae* and *Sclerotinia americana*, respectively: ibid., viii, p. 451; x, p. 317]. Lime-sulphur plus nicotine or nicotine sulphate (0·05 per cent. nicotine is the standard concentration recommended) is used against fungi and soft-bodied insects attacking pome fruit and stone fruit trees; soap, which reacts with the lime-sulphur to form insoluble calcium soap, should not be added. The addition of casein or lime-casein spreaders does not materially improve the excellent wetting and spreading qualities of lime-sulphur.

Bordeaux mixture plus lead arsenate provides a good stock spray against chewing insects and endoparasitic fungi attacking plants that tolerate summer applications of Bordeaux mixture; spreading and adhesiveness are, however, improved by the addition of a highly refined, unemulsified summer oil at a concentration of 0·25 per cent. Bordeaux or Burgundy mixture plus nicotine or nicotine sulphate and the same spreader is used against soft-bodied insects and fungi other than powdery mildews on plants tolerating Bordeaux mixture during the growing season.

Lime-sulphur plus lead arsenate plus colloidal sulphur is effective against ecto- and endo-parasitic fungi and chewing insects and as a standard summer spray against apple mildew.

Cunningham (G. H.). **Effects on Apple trees of lime-sulphur following Bordeaux mixture.**—*New Zealand Journ. of Agric.*, xlviii, 1, pp. 15–17, 1934.

Field tests in New Zealand indicated that contrary to the belief held by some growers applications [e.g., against *Venturia inaequalis*] of Bordeaux mixture or copper sulphate in combination with lime-sulphur in the spraying programme are not injurious to apple trees, provided that the lime-sulphur is not present in excess. Soluble copper compounds are not formed when Bordeaux mixture (3–4–50) is combined with 0·2 per cent. lime-sulphur, an approximately neutral compound being produced. No noticeable damage followed a pink or pre-pink application of 0·2 per cent. lime-sulphur to apple trees sprayed at the green-tip stage with Bordeaux mixture (5–4–50).

Injury is unlikely to result when apple trees are sprayed at the green-tip stage with Bordeaux mixture (5–4–50 or 3–4–50), followed at the pink or pre-pink stage with 0·2 per cent. lime-sulphur.

The varieties used in these experiments were Delicious, Jonathan, Sturmer, and Rome Beauty.

Loewel (E. L.). **Auswirkung der Kupferschäden zu den einzelnen Spritzzeiten.** [The operation of copper injuries at individual spraying dates.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 2, pp. 71–76, 1 fig., 1934.

The copper-containing fungicides (Bordeaux mixture, Wacker's [see above, p. 418] and Bayer's copper-lime, cuprosa, and nosperit)

used on apple trees in the Altenland district of Germany against scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xii, p. 297] caused no damage to healthy leaves when applied during the period of the bursting of the buds (between 10th and 20th April) at concentrations up to 2 per cent., while at 0·75 to 1 per cent. they may safely be given until the beginning of May. Only when the bud leaves show signs of having been injured by frost, insects, or carbolineum preparations containing too much phenol was there a certain amount of scorching or retarded growth as a result of copper spraying after the buds had opened. Even when applied during the blossoming period the copper fungicides at 0·5 per cent. caused only slight injury to the resulting fruit, especially when followed by lime-sulphur plus lead arsenate. From petal fall to about 15th June the risk of causing scorching of the fruit increases, to decline again from the end of the month onwards with the thickening of the cuticle.

MacDaniels (L. H.) & Burrell (A. B.). **The effect of sulphur fungicides, applied during the bloom, on the set of Apple fruits.**—*Phytopath.*, xxiv, 2, pp. 144–150, 1934.

This is an expanded and tabulated account of the writers' studies in New York, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 34], on the effect of lime-sulphur and sulphur dust, applied during the blossoming period against scab [*Venturia inaequalis*] and other diseases, on the set of apple fruits.

Hildebrand (E. M.). **The origin of roots stimulated by hairy-root bacteria in Apple stems.**—Abs. in *Phytopath.*, xxiv, 1, p. 11, 1934.

Some four weeks after the inoculation of nursery apple trees with *Pseudomonas* [*Bacterium*] *rhizogenes* [*R.A.M.*, xi, p. 561], hairy roots begin to be formed in the callus tissue elaborated by the host in response to the combined effects of wounding and the presence of bacteria. Wounding alone appears temporarily to stimulate the multiplication of the ray cells of the xylem and the cells of all the living tissues outside the woody cylinder except the epidermis. The re-establishment of cambial continuity, which normally checks this process, is largely prevented by the presence of the bacteria, with the result that further proliferation and root formation take place. The first and second weeks after inoculation are marked by cell multiplication over almost the entire wound, the 'islands' surrounding the necrotic groups (bacteria, crushed cells, and foreign matter) appearing as circular areas of hyperplasia. Late in the second week meristematic areas begin to develop in the elaborated tissues, whence the roots are subsequently produced independently of the deeper normal layers.

Burgert (Irma A.). **A study of some factors influencing germination of the spores of Phyllosticta solitaria.**—*Trans. Kansas Acad. Sci.*, xxxvi, p. 82, 1933.

The best germination of *Phyllosticta solitaria* spores in distilled water was obtained from cultures at least four weeks old, the minimum, optimum, and maximum temperatures for the process

being 5°, 21° to 23°, and 39° C., respectively [*R.A.M.*, xii, p. 701]. Spores from pycnidia in apple bark cankers showed consistently poorer germination than those from culture, but their temperature relations were identical. Germination was increased in bark decoction and diminished in apple fruit juice, as compared with distilled water. Bark tissue (especially of apple) placed near the germination drop acted as a stimulant, but spore growth was retarded by pieces of orange rind or fruit, onion scale or shoot, and apple fruit tissue. No appreciable influence was exerted by varying degrees of light. In culture the spores of *P. solitaria* begin to germinate almost immediately they are formed, but as the germination percentage increases subsequently there would seem to be an interval between the morphological and physiological maturity of the spores both in nature and in culture.

Shaw (L.). **Intercellular relative humidity in relation to fireblight resistance in Apple and Pear.**—Abs. in *Phytopath.*, xxiv, 1, p. 17, 1934.

Measurements were made of the growth of the apple and pear fireblight pathogen (*Bacillus amylovorus*) on various culture media at relative humidities of 99·9, 99, 98, 97, 96, and 95 per cent., corresponding approximately to osmotic pressures of 2, 12, 27, 41, 55, and 68 atmospheres, respectively. The maximum growth occurred at the highest relative humidity, with a drop to about $\frac{1}{2}$ at 99 and $\frac{1}{10}$ at 98, below which practically no development was made. A direct correlation was observed between increased resistance to fireblight and lowered relative humidity in the intercellular spaces of the tissues, 97 per cent. being associated with complete resistance to infection and 100 per cent. with maximum susceptibility.

Wilson (E. E.). **Bacterial canker of stone-fruit trees in California.**—*Hilgardia*, viii, 3, pp. 83–123, 8 figs., 1933. [Received May, 1934.]

Although bacterial gummosis of stone fruit trees usually differs from bacterial sour sap [*R.A.M.*, ix, p. 598] in the presence of abundant gum and better-defined, deeper cankers, no differences in the symptoms of the two conditions remain constant throughout the year. Isolations from the cankers of both types of disorder gave two groups of organisms, inoculations with either of which produced identical symptoms and both forms of canker on plum, peach, apricot, and cherry limbs. Parallel inoculations of President (*Prunus domestica*) and Wickson (Japanese plum, *P. salicina*) plum trees gave indefinite cankers without gum formation on the former and well-defined ones with abundant gum on the latter. It is evident that both conditions are manifestations of the same disease.

Both groups of bacteria were similar in size, in the number and arrangement of the flagella, in growth characteristics on various media, and in utilization of carbon and nitrogen compounds, and only slightly different in liquefaction of gelatine and reaction on milk. The most consistent difference was in intensity of pigment production, one (referred to as the 'green' group) producing a

lumière-green discoloration of most media, while the other, or 'white' group (found in 85 to 90 per cent. of the isolations), formed a lemon-yellow pigment in certain media only. The two groups are regarded as strains of the same species.

The identity of the white strain from both types of canker with *Pseudomonas prunicola* (received from Wormald) [ibid., xii, p. 455] was confirmed, and the green strain was identified as *P. cerasi* [ibid., xi, pp. 249, 311; xii, p. 227]. The white strain is therefore considered to be a variety of the earlier named species and is termed *P. cerasi* var. *prunicola* n. var., a technical description being given in English.

Inoculations of plum and cherry trees gave only small lesions in early autumn and late spring, but extensive cankers in late autumn and early spring. That the host itself may influence the progress of the disease was indicated by the fact that the small lesions were buried in new host tissue, while the others were not.

It is pointed out that the bacterial sour sap studied in California is not related to the similarly named condition attributed in the United States and other countries to physiological disturbances [ibid., iv, p. 20; ix, p. 288]. A bibliography of 33 titles is appended.

LAUBERT (R.). **Was jeder über die Plowrightia-Krankheit der Obstbäume wissen sollte.** [What everyone should know about the *Plowrightia* disease of fruit trees.]—*Die Kranke Pflanze*, xi, 1, pp. 3–5, 1 fig., 1934.

A popular note is given on the history, symptoms, etiology, and control of 'black knot' (*Dibotryon morbosum*) of plums, cherries, apricots, peaches, almonds, and other species of *Prunus*, hitherto reported only from North America [*R.A.M.*, x, p. 392]. The stringent plant protection regulations now in force should serve to exclude the black knot fungus from Germany, but in the event of its appearance the proper authorities must immediately be notified.

FITZPATRICK (R. E.). **The life-history and parasitism of Taphrina deformans.**—*Scient. Agric.*, xiv, 6, pp. 305–326, 2 pl., 6 figs., 4 graphs, 1934.

Studies [which are fully described] conducted in Ontario showed that peach infection by *Taphrina deformans* [*R.A.M.*, xii, p. 227] takes place in spring; in the Niagara district it seldom, if ever, occurs in summer. The ascospores and the sprout conidia derived from them persist through the summer and winter on the twigs and buds, where the conidia presumably multiply and from which they are washed on to the opening leaf buds by the spring rains. Penetration may occur from either leaf surface, the spore producing a short hypha which attaches itself to the leaf and through which the spore contents pass into the cuticle, where limited growth is made. Penetration then takes place between the epidermal cells, and for a time the fungus grows out in all directions in the intercellular spaces among the parenchyma cells. The mycelium is irregular, and at first very thin and without septa, but it thickens later on, numerous cross walls being laid down.

Only cells in actual contact with the mycelium become hypertrophied, which causes the diseased tissue to appear sharply delimited. Stomatal penetration as described by Martin [ibid., iv, p. 447] was never observed. There is no evidence that the fungus ever becomes perennial in the attacked twigs.

The nuclear cycle differs from that of *T. epiphylla* and *T. klebahni* [ibid., vi, p. 587] in that no copulation occurs before infection, the binucleate condition being brought about by the division of the haploid nucleus of the spore at the time of infection to give a pair of nuclei [cf. ibid., vi, p. 762]. When the spore contents pass into the host cuticle the two nuclei divide conjugately, giving rise to other pairs and so producing the binucleate mycelium. The nuclear situation in *T. deformans* is comparable to that of a short-cycle rust of the *Puccinia malvacearum* type, in which the diploid phase is initiated directly from a monobasidiospore infection. The nuclear situation in *T. epiphylla* and *Ustilago violacea* is essentially the same as that of a long-cycled rust of the *P. graminis* type, two haploid spores of opposite potentiality being necessary for the completion of the life-cycle. If *P. malvacearum* is, as has been suggested [ibid., x, p. 556], a reduced form from the long-cycled type of rust, the same process of evolution which is occurring in the rusts may be taking place in the genus *Taphrina*, so that *T. deformans* may be a short-cycled form evolved from the long-cycled *T. epiphylla* type and in which hybridity has been lost and each haplont becomes self-fertile.

Trifonova (Vera). **Die Rotfleckenkrankheit der Pflaume Polystigma rubrum (Pers.) D.C.** [The red spot disease of the Plum, *Polystigma rubrum* (Pers.) D.C.]—*Phytopath. Zeitschr.*, vii, 1, pp. 73–92, 6 figs., 1934.

The red spot disease of plums (*Polystigma rubrum*) is stated to be responsible for very heavy damage in Bulgaria (where the present studies were conducted), Serbia [*R.A.M.*, xi, 660], and Russia, the indigenous Küstendil damson being particularly liable to infection.

The fungus restricts its attacks to the foliage, on which it forms circular, elliptical, or irregular blood-red spots, later turning blackish, averaging 6 to 7 mm. in diameter, somewhat sunken on the upper and correspondingly raised on the under side, where the dark red ostioles of the pycnidia are visible. The morphology of *P. rubrum* is fully described. The fungus is an obligate parasite and all attempts to grow it on artificial media gave negative results. Inoculation experiments on young damson leaves with an aqueous suspension of the ascospores of *P. rubrum* were successful, whereas it was impossible to induce the typical symptoms of the disease with pycnospores. It is suggested that the fungus is heterothallic and that monospore infections with the ascospores in the spring produce spots composed exclusively of unisexual pycnidia. At the end of the summer the archicarps with trichogynes formed in the spots would also be of different sexes. At the same time in rainy weather the pycnospores would be exuded and reach the trichogynes, the + pycnospores penetrating the − trichogynes and conversely. From this fusion arise the perithecia and in the spring

the separation of the sexes recommences with ascospore formation. The emergence of the trichogyne, to which numerous pycnospores nearly always adhere, was frequently observed in the writer's histological studies, but owing to the impossibility of obtaining pure cultures of *P. rubrum*, the foregoing hypothesis regarding pycnospore function could not be definitely substantiated.

Good control of red spot was obtained by three applications of 1 per cent. Bordeaux mixture or solbar and 1 in 40 lime-sulphur between the end of April and beginning of June, the critical period for mass infections. In damp seasons *P. rubrum* is also liable to destruction on an extensive scale by *Gloeosporium polystigmicolum*, which may considerably reduce the ravages of the plum parasite in the following year.

The 'degeneration' of the Strawberry.—*Imper. Bureau of Fruit Production Tech. Communication* 5, 28 pp., 1934.

This survey of recent researches conducted in numerous countries into strawberry degeneration consists of four distinct contributions by D. Akenhead, R. V. Harris, G. H. Berkeley, and A. M. Massee dealing, respectively, with the pomological, virus, root rot, and entomological aspects of the problem. In the second paper yellow edge [*R.A.M.*, xii, p. 519], crinkle [ibid., xiii, p. 110], and gold disease [ibid., xiii, p. 41] are briefly discussed; the third includes root rots associated with *Rhizoctonia* [ibid., xi, pp. 380, 661; xii, pp. 489, 680], *Leptosphaeria coniothyrium* [ibid., xi, p. 252], and several other fungi, mention being also made of the red core disease associated with a species of *Phytophthora* [ibid., ix, p. 795] and of *Verticillium* wilt [ibid., xii, p. 139]. Each section has a comprehensive bibliography.

Plakidas (A. G.). **Rosette of Blackberries and Dewberries.**—Abs. in *Phytopath.*, xxiv, 1, pp. 15–16, 1934.

'Double blossom' or rosette, the most serious disease of blackberries and dewberries in Louisiana, is generally attributed to *Fusisporium rubi* [*R.A.M.*, xi, p. 727], but the writer's investigations point to a species of *Cercosporella* as the agent. Inoculations with pure cultures of the latter consistently gave rise to the disease. Natural infection takes place on the primary canes in the spring, but the appearance of the symptoms is delayed until a year later when growth is resumed. At this juncture the infected buds produce witches' brooms and abnormal blossoms setting no fruit. The infection period ranges from about the middle of March, when the spores begin to appear on the diseased flowers, to the middle of June. Practically complete control may be obtained by the application to the primary canes of 4–4–50 Bordeaux mixture every ten days from 1st April to 1st June.

Wardlaw (C. W.). **Banana diseases. VI. The nature and occurrence of pitting disease and fruit spots. VII. Notes on Banana leaf diseases in Trinidad.**—*Trop. Agriculture*, xi, 1, pp. 8–15, 4 pl., 1934.

In the first of these two papers details are given of the author's investigation of the occurrence in Trinidad of the banana pitting

disease (*Piricularia grisea*), first recorded there in 1933 [*R.A.M.*, xiii, p. 252]. So far it has been found to be mainly restricted to the Giant Governor and Governor [varieties of *Musa cavendishii*], only occasional bunches showing sufficiently severe infections to cause serious finger dropping. On the Gros Michel the disease was found to occur in a very mild form, the minute pits or spots becoming perceptible only on yellow fruit approaching final maturity. Although incomplete, the data suggested a direct relationship between the outbreak of the disease and the abnormally prolonged and continuous rainy period which prevailed in Trinidad during the 1932–3 season, and supported the contention that infections on the bunches are of field origin but remain dormant until the fruit has been in storage for some time. The possibility of controlling the disease under various weather conditions is briefly discussed.

In a brief outline of the literature on banana fruit spots the author refers to Petri's [ibid., xi, p. 765] and Deighton's [ibid., xii, p. 201] papers, in which the spots were attributed to the activity of various fungi, and to recent communications from Johnston, and Johnston and Slocum (*Res. Dept. United Fruit Co. Bulls.* 41 and 43, Boston, Mass., 1932) who described under the name 'the fruit spot' a disease on Gros Michel bananas in Jamaica and Central and South America, which they attribute to physiological causes. In Trinidad investigations indicated that the fruit spots are of fungal origin; besides *P. grisea*, other fungi such as *Helminthosporium torulosum* and *Gloeosporium musarum* have been isolated, but the preponderance of the first-named in early isolations and its slow growth rate as compared with the others indicate that it is the chief cause of the pitting disease, with *H. torulosum* and *G. musarum* as primary causes of other types of spots on the fruit, not always distinguishable macroscopically from pitting. As a general rule, the spots are of scanty occurrence and economically unimportant in Trinidad, although severe spotting may be occasionally observed in the Cavendish variety. Information from Brazil indicates that the removal of the bracts previously recommended [ibid., xi, p. 728] has not been effective in areas of high rainfall in the control of pitting.

In the second paper brief notes are given on the different banana leaf spots that occur in Trinidad, namely, black spots of the type described by Ashby from Jamaica, from which isolations consistently yielded *H. torulosum*, sometimes associated with *Pestalozzia leprogena*, *Nigrospora oryzae*, *Acrothecium lunatum* [*Curvularia lunata*: see below, p. 475], and *Fusarium semitectum* [ibid., xiii, p. 128]. Lenticular, pale brown spots with a dark periphery and yellow margin, and marginal wedge-shaped infections yielded a mixed fungal flora [a list of which is given], among which *Cordana musae* (*Scolecotrichum musae*) [ibid., vi, p. 144; xii, p. 458] was the most common and conspicuous, all the evidence available indicating that this fungus is the active parasite in such spots. An enumeration is also given of the fungi (regarded as weak parasites) which have been isolated from spots on debilitated banana plants and also of those obtained from a characteristic leaf mottling or speckling with minute, brown specks, which is stated to be of very frequent occurrence in some parts of Trinidad.

Wardlaw (C. W.). **Preliminary observations on the storage of Avocado Pears.**—*Trop. Agriculture*, xi, 2, pp. 27–35, 2 pl., 1 fig., 4 graphs, 1934.

In preliminary storage trials [which are described and the results of which are tabulated and expressed graphically] with West Indian avocado pears conducted at the Low Temperature Station, Trinidad, fungal wastage in fruit stored at tropical temperatures was largely due to anthracnose (*Colletotrichum gloeosporioides*) [*R.A.M.*, viii, p. 727], while in cold storage much of the loss, consisting of stem-end rot, spreading spots, blemishes, and soft rots, was caused by *Botryodiplodia theobromae* [ibid., xii, p. 707], in association with which *Fusarium* and *Phomopsis* spp. were occasionally isolated: wounded areas became infected by *Penicillium expansum*.

On the whole, purple varieties were less affected by storage diseases than green ones, some of the latter being very liable to attack by anthracnose and soft rots. Fruit held at 40° and 45° F. and ripened up to 75° in the course of five to seven days suffered very little from fungal invasion, the main cause of rejection being internal discoloration due to chilling. The tests showed that of the 33 varieties used, 22 were apparently not sufficiently cold-resistant to stand a temperature of 40° to 53° F. for 15 to 20 days without developing a characteristic brown discoloration resembling internal breakdown.

Amtliche Kontrolle von Pflanzenschutzmitteln. [The official supervision of plant protectives.]—*Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 1, p. 9, 1934.

A list is given of certain plant protectives of established efficacy that have been placed by their respective manufacturers under the permanent supervision of the Vienna Plant Protection Institute. Guarantees respecting the composition of the preparations are supplied by the firms and their validity verified by the examination of samples from the factory or agency, or on farms, vineyards, and other establishments in which the products are used.

Les pulvérisateurs. [Sprayers.]—Publ. of *Direct. Gén. Agric., Comm. et Colon.* [Morocco], *Service Défense Végét.*, 7 (2nd edit.), 101 pp., 64 figs., 1934.

This pamphlet consists of a series of papers giving technical details of the construction and working of a large number of types of sprayers now used in the control of parasitic diseases and insect pests of cultivated crops, and is meant to assist the practical grower in the choice of the spraying apparatus best suited for his purposes.

Atanasoff (D.). Болести на културнитѣ растения. [Diseases of cultivated plants.]—xv + 622 pp., 221 figs., Университетска Библиотека [University Library] 137, Imprimerie de la Cour, Sofia, 1934.

This text-book, designed for the usage of practical agriculturists and growers, gives an account in semi-popular language of the more important physiological and nutritional troubles, and of

virus, bacterial, and fungal diseases of cultivated useful and ornamental plants in Bulgaria. The morphology and biology of the causal organisms are very briefly indicated, while the symptoms are more fully described. The relative economic significance of the diseases and the measures for their control are discussed in some detail in each case, the relevant bibliography being appended to the account of each disease. The book is well illustrated, some of the figures being original, and terminates with an index of the Latin names of the hosts and parasites.

Clinton (G. P.). **Plant pest handbook for Connecticut. II. Diseases and injuries.**—*Connecticut Agric. Exper. Stat. Bull.* 358, pp. 151–329 + xi–xxvi, 55 figs., 1934.

This very useful publication, destined for the use of practical agriculturists and growers, gives a brief account of the symptoms of all the fungal, bacterial, and virus diseases, and of all the physiological and other troubles caused by environmental influences, which have been observed by the author on cultivated economic and ornamental plants in Connecticut. They are listed in the alphabetical order of the common names of the hosts. In some cases control measures are indicated, and in an addendum notes are given on work done by the author on certain of the diseases or injuries, as well as on a few that are of special importance because of recent outbreaks in the State. The book terminates with a full Latin index of the parasitic and saprophytic bacteria and fungi dealt with, with the hosts on which they were found.

Projet d'enquête sur la dispersion géographique des champignons parasites des végétaux en Europe et constitution d'un herbier cryptogamique. [Proposed inquiry into the geographical distribution of fungal parasites of plants in Europe and formation of a cryptogamic herbarium.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9–10, p. 313, 1933. [Received May, 1934.]

In pursuance of an earlier proposal, the execution of which was delayed by the war, of forming a cryptogamic herbarium and assembling information on the present geographical distribution in Europe of the fungal parasites of plants, the Société de pathologie végétale et d'entomologie agricole de France invites the co-operation of members in forwarding specimens (which, after examination and classification, will form the subject of notes in the *Revue* of the Society) to the Secrétariat Général at 16, rue Claude Bernard, Paris. Envelopes should be marked 'Herbier Cryptogamique'.

Fajardo (T. J.). **Plant-disease problems confronting truck farmers in Trinidad Valley and the vicinity of Baguio, Mountain Province, Philippine Islands.**—*Philipp. Journ. of Sci.*, lviii, 1, pp. 67–95, 25 pl., 1934.

Notes are given in semi-popular terms on the most important and common diseases of vegetable and other crops, chiefly of the Cruciferae, Cucurbitaceae, Leguminosae, Solanaceae, and Umbelliferae, in Mountain Province, Philippine Islands. The paper is

illustrated by excellent photographs and some brief recommendations for control are given.

Doak (K. D.). **Fungi that produce ectotrophic mycorrhizae of conifers.**—Abs. in *Phytopath.*, xxiv, 1, p. 7, 1934.

The following combinations of fungi and conifer seedlings yielded typical ectotrophic mycorrhiza in pure culture [*R.A.M.*, xii, p. 778]: *Boletus bicolor* with *Pinus rigida*; *B. granulatus* with *P. strobus* and *P. taeda*; *B. eximus* with *P. taeda*; *B. brevipes* with *P. rigida* and *P. taeda*; *B. chromapes* with *P. taeda*; *Boletinus pictis* with *P. strobus*, *P. taeda*, *P. resinosa*, and *P. rigida*; *Cantharellus ciborius* and *Amanita muscaria* with *P. taeda* and *P. strobus*; *Russula lepida* with *P. rigida*, *P. taeda*, and *P. strobus*; and *Scleroderma vulgare* with *P. strobus*. The characteristic mantle and Hartig network were histologically demonstrated in each case. The fungi grew well in sand cultures with sterile seedlings, supplemented by a mineral nutrient solution with 0·5 per cent. dextrose, successful reisolations being made in the majority of cases.

Hatch (A. B.). **Preliminary note on the relation of mycorrhizae to dry-weight increase in Pinus strobus.**—Abs. in *Phytopath.*, xxiv, 1, p. 10, 1934.

From a statistical calculation of the dry weights of *Pinus strobus* seedlings grown in pot cultures with mycorrhizal fungi [see preceding abstract] it was inferred that the latter are not detrimental to the growth of the plants. A similar assumption with regard to the potential benefits of the mycorrhizal association is not, however, justifiable on account of the possible masking of such effect. Mycotrophism in *P. strobus* is apparently induced by low internal nutrient concentrations, so that the initial development of mycorrhiza is correlated with this factor. The beneficial theory postulates superior absorptive efficiency for mycorrhiza, hence seedlings varying in nutrient reserves at germination should tend towards uniformity on exposure to mycorrhizal inocula. This may apparently occur, since seedlings grown in soil cultures have lower variation coefficients than sand culture seedlings, from which such inocula are absent.

Hansen (H. P.). **Inheritance of resistance to plant diseases caused by fungi, bacteria and vira. A collective review with a bibliography.**—Reprinted from *Yearbook Roy. Veter. & Agric. Coll. Copenhagen, 1934*, 74 pp., 1934.

In a brief introduction this paper is stated to be an attempt to bring together and to correlate the results, described in the relevant literature up to the end of 1932, of genetical investigations of the inheritance of resistance to fungal, bacterial, and virus diseases in hybrids of economically important plants belonging to 18 natural orders. The cytological and genetical conditions of most of the hybrids (with the exception of the *Oenothera* crosses [*R.A.M.*, ii, p. 74], which are dealt with separately) are referred to three main groups, namely, entirely fertile hybrids, resulting from intervarietal and interspecific crosses; partly fertile hybrids, resulting from interspecific crosses; and partly sterile and fertile hybrids, result-

ing from interspecific and intergeneric crosses, and the results of the investigations reviewed are discussed in some detail under each of these groups. A section is given to linkages between resistance and other host characters and another to resistance in chimaeras. The literature dealt with is arranged first in the alphabetical order of the Latin names of the hosts, and secondly in the alphabetical order of the authors' names, and comprises over 250 titles.

De Philippis (A.). **Alcune ricerche di fitoimmunità.** [Researches on phyto-immunity.]—*Ann. R. Ist. Sup. Agrar. e Forest., Firenze*, Ser. II, iv, *1931–1933*, pp. 117–135, 3 figs., 1934.

In studies of plant immunity [*R.A.M.*, xiii, p. 159], examination of the anatomical and morphological characters and analysis of the juice of two varieties of celery, one resistant and the other susceptible to *Septoria petroselini* var. *apii* [*S. apii*: ibid., xii, p. 743], indicated that the resistance shown by the one variety was probably dynamic and due to a difference in capacity to react to the attack between the two varieties.

Attempts to immunize bean (*Phaseolus vulgaris*), *Ricinus*, pea, and celery against *Botrytis cinerea*, *Sclerotinia fuckeliana*, *Fusarium* sp., and *S. apii*, respectively, by watering the seedlings with the culture liquid prior to inoculation, gave negative results, though some degree of immunization resulted when the same liquid much diluted was injected into the seedlings; injections with strong solutions of the culture liquid killed the plants. From a comparison of the results obtained from the watering and the injections the author concludes that the watered plants cannot have absorbed any considerable amount of the excretory products of the fungi through the roots.

The resistance of *P. vulgaris* seedlings to *B. cinerea* was markedly increased by the addition to the sand in which they were growing of solutions of zinc sulphate, magnesium sulphate (each 0·05 per cent.), or lithium carbonate 0·03 per cent. in Knop's nutrient solution.

Reid (R. D.). **Some observations on the ability of a mold, or its metabolic products, to inhibit bacterial growth.**—*Journ. of Bact.*, xxvi, 1, p. 28, 1934.

A species of *Penicillium* closely allied to *P. notatum* [*R.A.M.*, xii, p. 387] was found to be capable of inhibiting the growth of certain bacteria in the same culture dish [cf. ibid., xii, p. 109], a similar action being also exerted by the filtrate of synthetic or infusion cultures of the organism after passage through a Berkefeld filter. The inhibitory substance was shown to be closely connected with a pigment developing simultaneously; it is comparatively thermostable, volatile under certain conditions, and contains amylase and catalase. Coincident with the production of the inhibitory substance are an increase in the hydrogen-ion concentration and a reduction in the surface tension of the broth medium. Activated charcoal adsorbs the inhibitory material, which was found, however, to be inseparable from the filtrate by dialysis, distillation at low temperatures, and precipitation with

salts. Its formation was prevented by the action of light and certain gases during the incubation period.

Wilcoxon (F.) & McCallan (S. E. A.). **The stimulation of fungus spore germination by aqueous plant extracts.**—Abs. in *Phytopath.*, xxiv, 1, p. 20, 1934.

The addition to distilled water of small quantities of tomato, orange, apple, or pear juice and aqueous extract of lily or gladiolus bulbs and dahlia or potato tubers induced nearly 100 per cent. germination in certain conidia that germinated poorly (*Pestalozzia stellata*, *Glomerella cingulata*, *Botrytis paeoniae*, and *Sclerotinia americana*) [*R.A.M.*, xii, pp. 107, 109] or not at all (*Penicillium* sp. and *Neurospora sitophila* [ibid., xiii, p. 7]) in the absence of a stimulant. Yeast extract and urine produced a similar effect, standard nutrient solutions being greatly inferior in this respect. About 0·05 per cent. of solids from tomato juice or yeast extract in the conidial suspension will give rise to nearly 100 per cent. germination in *P.* sp. and *N. sitophila*. The stimulatory factor is thermostable and dialysable.

Volonsky (M.). **Sur la nutrition de quelques champignons saprophytes et parasites.** [On the nutrition of some saprophytic and parasitic fungi.]—*Ann. Inst. Pasteur*, lii, 1, pp. 76–101, 1934.

A detailed account is given of the writer's experimental observations on the nutritional relations in pure culture of a number of saprophytic and parasitic fungi, the latter including *Pythium de Baryanum*, *Phytophthora parasitica*, *P. palmivora*, *P. cactorum*, *Ustilago maydis* [*U. zeae*], and various dermatophytes and entomophytes.

Yarwood (C. E.). **The diurnal cycle of Erysiphe polygoni.**—Abs. in *Phytopath.*, xxiv, 1, pp. 20–21, 1934.

The generative cell of the conidiophore of *Erysiphe polygoni* on red clover [*Trifolium pratense*: *R.A.M.*, xii, pp. 207, 615] was found in field and greenhouse observations in Wisconsin to divide during the day, and the distal of the two daughter cells developed within two days into the mature conidium. Each conidiophore usually matures a single conidium daily, liberation occurring normally about noon, about which time and somewhat later spores taken from mildewed plants show a much higher germinative capacity than those removed in the early morning or late evening. Daytime inoculations result in a higher percentage of infection than those made at night. In continuous artificial light the diurnal cycle is no longer apparent, and it is less marked in cloudy weather. In alternating artificial light and darkness, with fairly constant temperature and humidity, the diurnal cycle approximates to that observed under natural conditions. *E. polygoni* on *Delphinium* spp. [ibid., viii, p. 108] in the greenhouse showed a similar diurnal cycle in respect of conidial formation and germinability.

Drayton (F. L.). **The sexual mechanism of Sclerotinia gladioli.** —*Mycologia*, xxvi, 1, pp. 46–72, 3 pl., 2 figs., 1 diag., 1 graph, 1934.

Efforts to obtain a sexually formed fruiting body from the minute sclerotia of *Sclerotinia gladioli* n. sp. [the name proposed by the author for the fungus previously known in its sterile stage as *Sclerotium gladioli*, of which a technical description is in the press: *R.A.M.*, xi, p. 666] proved unsuccessful, but similar experiments with stromatic tissue led to the detection of receptive structures which, when spermatized with microconidia from certain other thalli, gave rise to typical apothecia. Monomycelial cultures develop both receptive bodies and microconidia, and a crossing experiment with ten isolates from crocus, gladiolus, and freesia showed that these could be divided on a compatibility basis into two groups, the compatibility factor segregating, in back-crosses between the receptive bodies of single ascospore cultures and microconidia from each of the parent isolates, in a ratio of 1 : 1.

The globose, hyaline microconidia of the fungus, measuring 1·2 to 1·8 μ in diameter, developed satisfactorily at room temperature in two to three weeks on a medium of potato-dextrose agar and *Lycium halimifolium* stems. The optimum temperature for the production of the receptive bodies on a wheat grain and water medium ranged from 18° to 24° C. These bodies measure 0·8 to 1·9 mm. in height and 0·4 to 0·8 mm. in width, and are columnar, sometimes branched or cockscomb-shaped, tapering to a rounded apex or occasionally slightly capitate, light brown, pilose, and surrounded by a thin mucilaginous layer. Neither the apothecia, receptive bodies, nor microconidia of *S. gladioli* have been observed in nature, but there is reason to believe that the last-named organs are formed in the soil near diseased plants, while the others probably arise from the stromata in badly infected corms. The phenomenon exhibited by the sexual mechanism of *S. gladioli* is not regarded as an example of heterothallism in Blakeslee's sense (*Proc. Amer. Acad.*, xl, p. 205, 1904), there being no segregation of the sexes in separate thalli, but rather a homothallic condition in which each thallus is self-sterile and fertility the result of fusion exclusively between certain compatible thalli.

Köhler (E.). **Beiträge zum Studium des Kartoffelabbaus. Beobachtungen auf dem Dahlemer Versuchsfelde der Biologischen Reichsanstalt.** [Contributions to the study of Potato degeneration. Observations on the Dahlem experimental field of the National Biological Institute.]—*Landw. Jahrb.*, lxxix, 2, pp. 205–217, 1 graph, 1934.

Aphids (*Myzus persicae*), which are stated to be very prevalent on the peach trees in the gardens surrounding the Dahlem experimental field, transmitted leaf roll from diseased to healthy Paul Krüger [President] potatoes to the extent of 100 per cent. in the writer's recent experiments [cf. *R.A.M.*, xiii, p. 49]. The primary symptoms of the disease were also observed on Wohltmann, Odenwälder Blaue, and Erdgold plants in the experimental field. The progeny of Klein-Spiegeler Wohltmann tubers suffering

from mixed infections by the mild mosaic or semi-latent X (ring) virus, and Y mosaic [see next abstract], planted out in 1932, gave a greatly reduced yield in 1933, the after-effects of the disease being most conspicuous in the lots from Halle and Leipzig and least in those from Freising and Königsberg, which showed relatively slight infection in the beginning.

Köhler (E.). **Untersuchungen über die Viruskrankheiten der Kartoffel. III. Weitere Versuche mit Viren aus der Mosaikgruppe.** [Investigations on the virus diseases of the Potato. III. Further experiments with viruses of the mosaic group.] —*Phytopath. Zeitschr.*, vii, 1, pp. 1–30, 17 figs., 1934.

A comprehensive, fully tabulated account is given of the writer's further studies at Dahlem, Berlin, on the potato mosaic viruses M 23, H 19, R 77, and G.A. [*R.A.M.*, xii, pp. 586, 587], from which it appeared that R 77 is a mixture of an M 23 or X-like virus (R) and a heavily diluted Y virus (Yr) [ibid., xiii, pp. 258, 319]. On the other hand, M 23, H 19, and G.A. were found to be pure. Two further viruses of the M 23 type were isolated by inoculation from potato on to Samson tobacco, namely, Wo 8 from the Wohltmann variety and E 1 from Erdgold. All the closely related viruses of this group are characterized by a tendency to produce chlorotic, often necrotic rings on tobacco leaves and may hence be collectively styled 'ring viruses' [cf. preceding abstract]. Combined with G.A. each of the ring viruses produces the same acute symptoms on tobacco. Neither in potato nor tobacco could those organs already permeated by one ring virus be infected by rubbing with another of the same group, indicating that the various members of the latter make similar demands, corresponding to their constitutional affinities, on the nutrients afforded by the substratum [cf. ibid., xii, p. 581]. Mixed infections by several ring viruses may, however, occur either spontaneously or as a result of inoculation with blends of the different juices, the resultant symptoms in such cases presenting transitional stages between the pure components [cf. ibid., xiii, p. 61].

Opposed to the ring viruses are those of the Y group, characterized by similar thermal relationships among themselves, incapacity to infect *Datura stramonium*, the production on tobacco leaves of more or less marked vein clearing [see next abstract], and the intensification of the symptoms induced on tobacco by a ring virus where combined with the latter. The previous inoculation of a tobacco plant with a weak Y virus does not preclude its subsequent infection by a strong one of the same type, the latter in fact completely suppressing and possibly even assimilating the former. Plant organs already infected by a ring virus may be just as readily attacked by one of the Y group as entirely healthy material and conversely, since the requirements of the two groups are quite different. In mixed infections by ring and Y viruses the degree of virulence of the latter determines the severity of the disease. Tobacco leaves inoculated by rubbing with a ring virus after previous infection by a strong Y virus first develop sunken, slate-grey, rapidly expanding spots and eventually die. This

phenomenon does not occur when the plants are first inoculated with a ring virus and then with one of the Y group.

The ring viruses M 23, H 19, and R were found to be transmissible by rubbing from tobacco to the Erdgold and Klein-Spiegeler Wohltmann potato varieties. The two originally isolated from Wohltmann, M 23 and H 19, remained unchanged on reisolation after transfer from Wohltmann to tobacco, whereas R, originating in a selection, underwent considerable and permanent weakening—so much so, in fact, that it has as good a claim as the other ring viruses to be regarded as independent. Further proof is thus afforded of K. M. Smith's contention that the several ring viruses are permanent variations of one and the same basic virus ('X type viruses') [ibid., xii, p. 648]. The G.A. (strong Y) virus infected Kl.–Sp. Wohltmann and underwent no loss of virulence on reinoculation into tobacco. Erdgold, however, has not so far reacted positively to inoculation with this virus. The weak Y component comprised in the R 77 virus was unable to infect either Kl.–Sp. Wohltmann or Erdgold.

Tobacco plants developing acute symptoms as a sequel to inoculation with a virulent virus blend (ring + strong Y) later recover almost entirely, although both virus components are present in high concentrations in the infected parts. This tolerance, however, is not transmitted to the seeds arising from such plants, which produce seedlings showing no more resistance to virus infection than those from healthy individuals.

Two Erdgold plants were found to harbour two different latent viruses, E 8 [ibid., xiii, p. 119] and E 9, both of which were transmissible to tobacco, remaining latent on the latter host also. Combined with a ring virus they produce conspicuous curl-mosaic on Erdgold and a typical blend of symptoms on tobacco. A peculiar dark mosaic on an Erdgold plant may possibly (on the basis of analogous experiences) be attributed to a combination of a virus (? E 8) latent on tobacco with one that is transmissible neither to tobacco, potato, nor *D. stramonium*. A similar dark mosaic was once observed on a Paul Krüger [President] plant.

Jones (L. K.), Anderson (E. J.), & Burnett (G.). **The latent virus of Potatoes.**—*Phytopath. Zeitschr.*, vii, 1, pp. 93–115, 3 figs., 1934.

The authors consider that the latent or 'healthy potato' virus commonly found in American potatoes appears to be the same as the X virus of English workers, while the veinbanding virus often associated with it corresponds to the Y virus in England [see preceding abstracts].

Tests [the results of which are fully discussed and tabulated] on John Baer tomatoes and Connecticut Havana tobacco plants as indicators at the Washington (State) Agricultural Experiment Station in 1931–2 showed that the latent virus was present, usually in a mild form, in 1,079 apparently healthy potato plants of several standard varieties, as well as in 188 affected by different virus diseases. From 4·5 per cent. of the seemingly healthy plants the latent virus produced virulent, necrotic symptoms on tobacco, while six such plants carried a virus causing a disorder on tobacco similar

to that resulting from inoculation with rugose mosaic of the potato. Potato plants showing symptoms of the latter disease usually harboured a virus capable of inducing spot necrosis on tobacco [*R.A.M.*, xii, pp. 108, 398, 580]. Three out of the 55 thus affected, however, produced only latent mottle symptoms on the transference of the plant juice to tobacco. In five tests with material from crinkle mosaic potatoes the inoculated tobacco plants developed spot necrosis, indicating that the former disturbance is merely an attenuated form of rugose mosaic.

By successive passage through tobacco plants the expression of the latent virus became intensified to a degree of virulence capable, either alone or in combination with the veinbanding virus, of inducing rugose mosaic on healthy Early Rose potatoes. Previous workers [reference to whose studies has been made in this *Review*] have shown that eleven Solanaceae are susceptible to systemic infection by the latent virus. Among these the latent virus was transferred in both its mottle and virulent form by the writers to *Nicandra physaloides*, *Datura stramonium*, and *Solanum nigrum*, and in addition to *Amaranthus retroflexus*. Three weeks after inoculation the affected plants were used as a source of infection for tomato and tobacco, on which the resulting symptoms were identical with those caused by the original latent virus. On the younger foliage of the four above-mentioned Solanaceae yellowing and mottling were constant features, accompanied by considerable necrosis in the case of the virulent form. Evidence was further obtained that the virulence of the latent virus may be even more rapidly increased by successive transfers through *N. physaloides* than by passage through tobacco.

These and other studies not yet reported lead the authors to conclude that both the latent and the veinbanding viruses are capable of such extensive modifications as to be able of themselves and without the addition of any other virus entity to cause a whole range of potato diseases, including rugose mosaic (crinkle A), crinkle mosaic, mild mosaic, and the various forms of streak. These modifications remain stable in a given host plant. The Z virus [ibid., xi, pp. 738, 741], in this view, would probably be an attenuated form of the Y virus.

Schultz (E. S.), Clark (C. F.), Bonde (R.), Raleigh (W. P.), & Stevenson (F. J.). **Resistance of Potato to mosaic and other virus diseases.**—*Phytopath.*, xxiv, 2, pp. 116–132, 1934.

None of the potato varieties, Green Mountain, Irish Cobbler, or Spaulding No. 4, or 33 seedlings representing 18 crosses, showed conclusive signs of resistance to leaf roll or spindle tuber in experiments carried out from 1924–32 for the most part in Presque Isle, Maine.

Spaulding No. 4 contracted a milder form of streak (stipple streak or acropetal necrosis) [*R.A.M.*, x, p. 746] than Green Mountain. Three types of reaction to this virus were observed among the different varieties, namely, (1) latent or masked, (2) mild foliar necrosis, and (3) severe dwarfing, curling, and necrosis of the tops, which usually die before tuber formation.

Seedling 41956 was found to be highly resistant to latent mosaic

[ibid., xii, p. 388; xiii, p. 320, and preceding abstracts]. The term latent mosaic is used by the writers to designate, not a single virus but several, one or other of which is present in every commercial variety tested; amongst these is the seedling streak present in Green Mountain which corresponds with Quanjer's acronecrosis or top necrosis. In field tests Katahdin (S. 42667) was also resistant to this disease, to which it succumbed, however, in tuber-graft experiments, contracting top necrosis.

Four types of reaction to mild mosaic [ibid., xiii, p. 257] may be differentiated, viz., (1) highly resistant, (2) seedlings rarely developing the disease in the field but liable to infection in tuber grafts, (3) seedlings manifesting milder symptoms than Green Mountain, and (4) those equalling the latter in susceptibility and clearness of symptom expression. The progeny of a cross between two resistant seedlings showed transgressive inheritance of mild mosaic, some being more resistant and others more susceptible than either of the parents. Two or more genetic factors, cumulative in effect, appear to be involved in the transmission of this resistance from parents to offspring. The Katahdin variety combines resistance to mild mosaic with other desirable economic characters.

Observations on the reaction of potatoes to latent and mild mosaic have shown that varieties readily succumbing to artificial inoculation seldom develop the diseases in the field, the performance of a given variety in which, therefore, is not necessarily indicated by its reaction to inoculation tests.

WHITEHEAD (T.). **The physiology of Potato leaf-roll. I. On the respiration of healthy and leaf-roll infected Potatoes.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 48–77, 2 figs., 18 graphs, 1934.

This is the full report of the author's investigation of the respiration of healthy and of leaf-roll potatoes, a preliminary account of which has already been noticed [*R.A.M.*, xi, p. 319]. In addition to the information previously given, it is stated that the work gave no evidence that the presence of the virus in the diseased plants had any direct influence on the rate of respiration, but only in so far as it affected the amount of available substratum required for respiration. Normally the accumulation of such substratum in the leaves of leaf-roll plants occurs at a very early stage of development; it can, however, be delayed by continuous exposure of the plants to light of low intensities, under which conditions the rate of respiration of the diseased plants approximates to that of healthy ones.

BECHHOLD (H.), GERLACH (W.), & ERBE (F.). **Die Kupferprobe zur Unterscheidung von gesunden und abgebauten Kartoffeln.** [The copper test for the differentiation of healthy and degenerated Potatoes.]—*Angew. Chemie*, xlvii, 2, pp. 26–30, 2 figs., 1934.

In order to distinguish between healthy and degenerated potato tubers, a piece of sheet-copper should be inserted into the tubers, which are left for 8 hours in the autoclave at 37° C. and for a further 16 hours at room temperature. On cutting the tubers at the end of this period, the healthy ones show an extensive dark brown to

black zone surrounding the copper, whereas the degenerated tissues show little or no alteration. The black discoloration is due to melanin formation following the wounding of the tissues [*R.A.M.*, xii, p. 531]. It was ascertained by analyses [full details of which are given] that the copper does not merely induce a local reaction in the shape of melanin formation, but diffuses throughout the blackened tissues as a catalyst. The penetration of the copper into the tissues is extensive in healthy and insignificant in diseased material. A correlation was detected between the amount of copper absorbed by the tuber and that of potassium displaced.

Spennemann (F.). **Der Einfluss von Bodenart, Bodenreaktion und Düngung auf den Kartoffelschorf.** [The influence of soil constitution, soil reaction, and manuring on Potato scab.] —*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, x, 7, pp. 264–270, 1934.

The results of protracted observations in Thuringia, Germany, indicate that while potato scab [*Actinomyces scabies*: *R.A.M.*, xiii, p. 259] is not restricted to sandy soils, it is more prevalent on them and other well-aërated types than on loam or clay. It is entirely absent on weathered limestone. The hydrogen-ion concentration is not an absolute criterion for the tendency to scab on a given soil, but in general the risk of infection is higher on the alkaline types. The influence of individual fertilizers on the course of the disease was found to be barely recognizable, but that of the general scheme of manuring was readily traceable, the deleterious after-effects of liming, for instance, being apparent. Scab was observed to be more severe in dry, warm years than in cool, wet ones.

Frutchey (C. W.) & Muncie (J. H.). **Soil treatment with mercurials for control of Potato scab.**—Abs. in *Phytopath.*, xxiv, 1, p. 9, 1934.

In three years' field and greenhouse trials, mercuric oxide, mercuric chloride, and Du Bay 965 H [cf. *R.A.M.*, xi, p. 259], applied in the row before planting, failed to control soil-borne potato scab [*Actinomyces scabies*]. Applications of mercuric oxide and mercurous chloride reduced the ratio of soil bacteria and fungi to *Actinomyces* under controlled low moisture conditions, the reverse being the case where the moisture content was high. Several strains of *A. scabies* made good growth in saturated solutions of mercuric oxide and mercuric chloride in tyrosinate liquid media.

Becker (K. E.). **Zur Auswahl der krebsfesten Kartoffelsorten.** [On the selection of wart-immune Potato varieties.]—*Deutsche Landw. Presse*, lxi, 5, p. 54, 1934.

In order to familiarize the grower with the 155 wart [*Synchytrium endobioticum*]-immune potato varieties officially recommended in Germany, these are arranged in tabular form showing the time of maturity and the colour of skin and flesh, so that the desired types may be readily selected.

Postelt (R.). **Krebsfester 'Industrie'-Ersatz?** [A wart-immune substitute for 'Industrie'?]—*Deutsche Landw. Presse*, lxi, 4, p. 40, 1934.

A number of substitutes for the Modrows Industrie potato variety, combining palatability with immunity from wart disease [*Synchytrium endobioticum*], are now on the German market, and of these the writer particulary recommends Ostbote (von Raddatz, Hufenberg) and Quitte (v. Zitzewitz, Muttrin). In a recent test these varieties yielded 136 and 163·5 cwt. per ¼ hect., respectively. Other promising sorts are Altgold, Sandkrone, and Herbstgelbe (von Raddatz), Treff As (v. Zitzewitz), Goldgelbe (Nordost, Königsberg), Sandkönig (Trog, Kl. Räudchen), and Flava (P[ommersche] S[aatzucht] G[esellschaft], Stettin).

Soltau (F.). **Erfahrungen über die Eisenfleckigkeit der Kartoffel.** [Experimental observations on Eisenfleckigkeit of Potato.]—*Deutsche Landw. Presse*, lxi, 7, p. 84, 1934.

Referring to Postelt's recent suggestions for the replacement of the Industrie potato by wart [*Synchytrium endobioticum*]-immune varieties [see preceding abstract], the writer draws attention to the importance of combined resistance to scab [*Actinomyces scabies*] and more especially to Eisenfleckigkeit [*R.A.M.*, xiii, p. 393]. The last-named disease was very severe in 1933, presumably on account of the changeable weather conditions. In the Bornim district, where the writer's observations were made, scab and Eisenfleckigkeit are seldom found in association, the alkaline reaction favouring the former being apparently adverse to the latter [cf. ibid., x, p. 126]. Varieties susceptible to scab are usually found to be resistant to Eisenfleckigkeit and vice versa. In 1933 Erdgold, Sickingen, Deodara, Parnassia, Blaupunkt, and Goldwährung proved highly susceptible to Eisenfleckigkeit; Goldfink, Wohltmann, Ackersegen, Konsum, and Delbrück less so; while Gisevius, Wekaragis, Industrie, and Odenwälder Blaue remained healthy. Of these Gisevius is the best for the locality under observation since it is also resistant to the highly prevalent scab. In general the smaller-sized tubers are considerably less liable to Eisenfleckigkeit than large ones; in an Ackersegen lot, for instance, those under 50 gm. showed only 8 per cent. affected, compared with 25 and 50 per cent. for the 50 to 100 and over 100 gm. weights, respectively. No evidence of the hereditary transmission of Eisenfleckigkeit has been obtained in the course of these investigations, the progeny of severely diseased Erdgold tubers (largely purchased at a cheap rate by local growers) [cf. ibid., xii, p. 653] on marshy soil being perfectly sound.

Foëx (E.). **Sur quelques maladies observées chez la Pomme de terre au cours de l'été 1933.** [On some Potato diseases observed in the summer of 1933.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9–10, pp. 300–309, 1933. [Received May, 1934.]

Notes are given on the following potato diseases observed in France in 1933, viz., blight (*Phytophthora infestans*), serious outbreaks of which were not common; *Colletotrichum atramentarium*,

found in a locality where it had been present ten years before [*R.A.M.*, v, p. 209]; *Verticillium albo-atrum*; an etiologically distinct condition due to *V. foëxii* [ibid., viii, p. 57], stated to be a fairly active rotting agent in certain circumstances, though in one test the progeny of affected tubers remained healthy; and a leaf spot resembling tipburn and attributed to the exceptionally dry, sunny summer [ibid., ii, p. 28].

The author considers that the pathogenicity of *C. atramentarium* has not yet been definitely established; his inoculations of healthily growing plants gave negative results, and he thinks that in all probability the fungus is unable to attack living tissues except when the plants are exposed to conditions predisposing them to attack.

Kovaleff (N. V.). К вопросу о селекции Картофеля на устойчивость против фитофторы. [On the question of Potato-breeding for resistance to *Phytophthora*.]—*Bull. Appl. Bot., Genetics, and Plant Breeding*, Leningrad, Ser. A. (*Plant Industry in U.S.S.R.*), 7, pp. 91–96, 1933.

The author prefaces this brief note by the statement that by far the most important disease of the potato in Russia is late blight (*Phytophthora infestans*) which, in years of heavy infestation, is responsible for direct losses through tuber rot ranging from six to nine million tons or, at the average price of 18 roubles [nominally 36*s.*] per ton, roughly from 100 to 160 million roubles [£10 to 16 millions], while indirect losses due to reduction in productivity of the affected plants are much higher. The vastness of the areas under the crop, as well as the scarcity of copper sulphate in Russia, renders the control of the disease by spraying impracticable, and all the efforts of the agricultural authorities are now directed towards the breeding of new resistant varieties through hybridization of the cultivated potato with varieties recently discovered by Russian expeditions to South and Central America. Reference is made to the work which is being done in this direction in Germany [*R.A.M.*, xiii, pp. 119, 260], and also to some crosses which have been lately made in Russia with *Solanum antipoviczii*, *S. demissum*, *S. semidemissum*, *S. neoantipoviczii*, and *S. ajuscoense* as the resistant parents, some of which appear to be very promising.

Beaumont (A.). **On the relation between the stage of development of the Potato crop and the incidence of blight (Phytophthora infestans).**—*Ann. of Appl. Biol.*, xxi, 1, pp. 23–47, 1934.

From a review of the relevant literature the author concludes that the results of experiments and observations made by previous investigators do not consistently support the common opinion that potato plants above a certain age are more susceptible than younger ones to infection with late blight (*Phytophthora infestans*) [cf. *R.A.M.*, v, p. 180]. Furthermore, the analytical methods usually employed are not accurate enough to interpret the results of simple field experiments, in which the conditions governing natural infection are practically impossible to control. This point was well illustrated in co-operative experiments in 1929 and 1930 [details

of which are given] at a number of centres in England and Wales, in which the development of the blight was studied in potato plots planted at regular intervals of time, and also by observations in 1931 at the Seale-Hayne College. While no definite information was obtained from these experiments as to the individual (inherent) susceptibility of the potato plants, the results showed that in the majority of cases the 'epidemic potentialities' (a function of many closely interrelated environmental factors, and not solely dependent on the inherent susceptibility of the individual plants) of a population of mature plants are greater than those of a similar group of young plants. This does not necessarily involve the assumption of the existence of differences in susceptibility between plants of different ages, for the differences in disease intensity and resultant rate of spread follow from the increasing chances of the occurrence of primary infection foci as the plants become older, and from the greater chances of the environment (more especially the microclimate) [ibid., iv, p. 471] being suitable for the development of the parasite among the older than among the younger plants. Only carefully controlled artificial inoculation experiments under uniform optimum conditions for infection can give definite information concerning the inherent resistance or susceptibility of individual plants at different stages of growth, and further study of the problem on these lines is strongly advocated.

Reyes (G. M.). **The black smut, or bunt, of Rice (Oryza sativa Linnaeus) in the Philippines.**—*Philipp. Journ. of Agric.*, iv, 4, pp. 241–270, 7 pl., 1933. [Received May, 1934.]

Apart from spore germination, all attempts at which gave negative results, the chief distinguishing morphological characters of *Tilletia horrida* [*R.A.M.*, xi, p. 289], the causal organism of black smut or bunt of rice in the Philippines, were found to agree with Takahashi's original description (*Bot. Mag.*, Tokyo, x, p. 16, 1896).

In order to determine the possibility of seed transmission of infection, 50 lightly smutted grains were sown, after soaking in sterile water, in sterilized soil in pots, with 50 similar uninfected controls. Only 36 of the 50 smutted seeds germinated and the resulting seedlings were severely stunted, while all the healthy seeds germinated and made normal growth. Fifteen of the diseased seedlings were transplanted in three pots in the open with five healthy ones in another pot as controls. Of the 15 diseased plants, ten were smutted, one died, and four were not visibly smutted, while none of the controls showed any trace of infection. The average number of culms per pot of inoculated seedlings was 6·2 compared with 10·6 for the controls, the average length being 114 cm. and 138·7 cm., and the average yield 11·36 and 25·15 gm., respectively. These results were in general corroborated by field experiments, in which 16 out of the 21 plants raised from infected seedlings were smutted, while no smut occurred in the controls from healthy seedlings. Infection was usually confined to one or two heads on a plant and often to only a few grains of a head.

The symptoms of black smut are described and the conditions favouring its occurrence and spread discussed with a view to

control. The disease is more prevalent on rice planted under irrigation during the dry weather than in the regular rice season, the early maturing varieties, such as Palagad, Sipot, Guinangan Str. 1, and Apostol, being chiefly affected, while Mancasar Str. 3 is comparatively resistant and Elon-elon apparently immune.

Nieuwpoort (D.). **Middel erger dan de kwaal?** [Is the remedy worse than the disease?]—*De Bergcultures*, viii, 7, pp. 148–151, 1 diag., 1934.

An article is cited from the *Algemeen Landbouwweekblad voor Nederlandsch-Indië*, 13th January, 1934, describing a bark disease in seven-year-old [*Hevea*] rubber bud grafts and seedlings on a Yang plantation. Tapping had been discontinued on the estate for some six months, and in most cases the disorder was confined to the regenerated bark, which had completely died off and peeled away from the wood. Negative results were given by inoculation experiments with various fungi isolated from infected material, and it is considered probable that the disease (which attacked the bud grafts to the extent of 37 per cent. while only 12 per cent. of the seedlings were affected) is of physiological origin. It is not unlikely (and this line of investigation is being pursued) that the coal-tar compounds applied to the bark for the control of stripe canker [*Phytophthora palmivora*: *R.A.M.*, xi, p. 600] may have weakened it to such a degree as to provide an ideal substratum for normally harmless fungi.

In this connexion the writer refers to the excellent results which have been obtained in the control of stripe canker and also of the more intractable mouldy rot [*Ceratostomella fimbriata*: ibid., xiii, p. 125] with an ointment known as 'Product A 2295', supplied by the Socony Vacuum Corporation. Great care must be taken not to apply the disinfectant to damp bark, a practice leading to exactly the same symptoms as those described in the article quoted above. Otherwise no injury has been sustained even on the most drastically tapped surfaces. The quantity of A 2295 required for each treatment varies according to the length of the tapping cuts between 300 and 600 gm., and the number of applications depends on the climate and on the situation of the trees, those in damp, shady ravines needing up to ten a month, while in airy, open plantations it is sufficient to give a treatment as soon as incipient infection is observed. In any case, the cost of disinfection by this method is trifling compared with the immense damage averted by its use.

Tayler (V. A.). **Oidium heveae.**—*Bull. Rubber Growers' Assoc.*, xvi, 1, pp. 8–10, 1934.

Over large areas in Malaya, particularly in the south, the hillsides of planted rubber, which a few years ago were fresh and green, now present a greyish, debilitated appearance, partly due to the branches, owing to their scanty foliage, becoming bleached by exposure to the sun. Observation and comparison of different areas did not support the view that this condition is due to defective cultivation rather than to *Oidium heveae* [*R.A.M.*, xiii, p. 181], alleged recovery from which is often only apparent, inasmuch as

the secondary leaves on affected trees, though seldom attacked, are much smaller than the original ones, and frequently only a few are present, generally because the new shoots die off, leaving the branches with only a new terminal whorl. Affected leaves remaining on the tree are often distorted, sometimes devoid of tips, show yellowish blotches when held up to the light, and may have only one leaflet. The author expresses his conviction that *O. heveae* is very largely responsible for this depreciated condition of the foliage, which in turn adversely affects bark renewal.

CHAUDHURI (H.) & SACHAR (G. S.). **A study of the fungus flora of the Punjab soils.**—*Ann. Mycol.*, xxxii, 1–2, pp. 90–100, 1934.

An annotated list, with English diagnoses, is given of 32 fungi from field, garden, coarse-grained alkaline, and humus soils in the Lahore district of the Punjab, India, including eleven species of *Aspergillus* (two new) and three (one new) of *Penicillium*. Most of the organisms recorded are already known as soil-inhabitants in other countries.

CHOLODNY (N. G.). **A soil chamber as a method for the microscopic study of the soil microflora.**—*Arch. für Mikrobiol.*, v, 1, pp. 148–156, 4 figs., 1934.

Full details are given of a contrivance, termed a soil press, which the writer has constructed with a view to further simplification of the study of the soil microflora [*R.A.M.*, xii, p. 324]. By this method a uniformly thick layer of moist soil, in the centre of which is a cylindrical space (about 4 mm. in diam.), is inserted between two slides. The soil micro-organisms develop within the chambers on the clean surface of the glass, the fungi forming fructifications which are generally readily determinable.

MARTIN (J. P.). **Pathology.**—*Ann. Rept. Ctte. in charge of the Exper. Stat. for the year ending September 30th, 1933* (ex *Proc. Hawaiian Sugar Planters' Assoc., Fifty-third Ann. Meeting, 1934*), pp. 24–35, 1934.

This report contains, among others, the following items of phytopathological interest. Studies by C. W. Carpenter have demonstrated that in some soils biological factors are largely responsible for the failure of commercial varieties of sugar-cane, and in soils of the phosphate-fixing type, where an unbalanced condition of nutrient occurs, the canes are attacked by *Pythium aphanidermatum* [*R.A.M.*, xii, p. 723]. Attack by the fungus is greatly increased by fertilizers yielding an excess of nitrogen and deficiency of calcium, iron, and phosphorus. *P. aphanidermatum* was abundantly present on the roots of Sudan grass [*Andropogon sorghum* var. *sudanensis*], in some instances depressing the growth. In pot studies P.O.J. 2878 and its related varieties were highly resistant to *P. aphanidermatum*. Evidence has also been obtained that aluminium toxicity may be an important factor in growth failure and may be ameliorated by potash applications.

In other experiments by Carpenter, mosaic leaves of Ba. 11566 cane were kept for ten minutes at temperatures ranging from 52°

to 56° C. and attempts were then made to transmit the disease from the treated to healthy Ba. 11569 leaves by Sein's needle-prick method [ibid., ix, p. 678]; the results of these inoculations indicated that the thermal death point of the virus lies between 53° and 54°. Knife transmission of mosaic has been effected with the susceptible variety Ba. 11569.

Symptoms of chlorotic streak [ibid., xii, p. 722] developed rapidly on sugar-canes in fields flooded during heavy storms, the attack being apparently largely due to secondary infection. Chlorotic streak is a problem only in certain localities of Hawaii, and experiments are in progress to ascertain its cause, its manner of transmission otherwise than by diseased cuttings, and the losses sustained through it.

Inoculation tests with various organisms isolated from nodal stalk rot [the symptoms of which are described: ibid., xii, p. 723] gave negative results.

KERR (H. W.). **Recent developments in the agriculture of Sugar Cane in Queensland.**—*Empire Journ. Exper. Agric.*, ii, 5, pp. 20–28, 1933.

When plant breeding was first instituted in Queensland in 1921, several very promising sugar-cane varieties, e.g., S.J. 4 and S.J. 7 were evolved, but the high susceptibility of the latter to leaf scald [*Bacterium albilineans*: *R.A.M.*, xiii, p. 325] soon necessitated its elimination. Since 1928, when a selection of the best breeding canes employed in Java was introduced to South Johnstone, much attention has been paid to the disease resistance of the progeny from all desirable crosses. Pathological investigations aiming at the early mass elimination of susceptible seedlings are in progress. In 1930 a breeding sub-station was established in the Cairns district, where cross-pollination is greatly facilitated by the free flowering of the canes. Seedling propagation now takes place at the Mackay and Bundaberg Stations, some 5,000 being planted annually at each of these centres and 10,000 to 12,000 at South Johnstone. In the course of a brief statement on disease researches [already noticed in this *Review*], it is mentioned that promising results in the control of gumming [*Bact. vascularum*: ibid., xii, p. 787] have been obtained by the hot-water treatment of infected cuttings.

Experiment Station notes.—*South African Sugar Journ.*, xviii, 1, pp. 11–13, 1934.

Notes are given on the performance of a number of new sugar-cane varieties at the Mount Edgecombe Experiment Station, Natal, in 1933. Co. 281, released for the first time during the current season, is stated to be in many ways the most promising variety as yet distributed from the Station. It is highly resistant to streak [*R.A.M.*, xii, p. 658] but somewhat susceptible to mosaic, the danger from which in Natal, however, has been much reduced and the sources of infection minimized. Co. 290 is highly resistant to streak and exceptionally so to mosaic, while P.O.J. 2728 may be considered immune from both diseases for all practical purposes. On the other hand, C.H. 64/21, an improved Uba, is highly suscep-

tible to streak, and its extended cultivation cannot be recommended now that better varieties are available.

BISSINGER (G. H.). **Some of the problems now facing the Research Bureau of the Philippine Sugar Association.**—*Sugar News*, xv, 1, pp. 19–24, 1934. [Spanish translation.]

The Research Bureau of the Philippine Sugar Association is confronted by two pathological problems in the shape of yellow spot [*Cercospora kopkei*: *R.A.M.*, xi, p. 205] and smut [*Ustilago scitaminea*: ibid., xii, p. 723]. P.O.J. 2878, which promises to supplant most of the old cane varieties grown in the Philippines, has proved to be highly susceptible to yellow spot, many fields showing nearly 100 per cent. infection. This disease is suspected to cause deterioration in the quality of the juice, and studies are in progress to verify the extent of the damage.

Smut has been present for some time in southern Luzon and is stated to be now assuming a serious form in the north of the province. Three years ago the writer observed one slightly infected field in the Isabela district of Negros, but recent reports indicate that smut has since spread as far north as Ma-ao. In order to avoid scattering the spores by roguing and removing the plants for burning, the following method of treatment is recommended. A 5-gallon tin partly filled with paraffin should be brought to the field, the blackened tips of the shoots wetted with the oil to prevent spore dispersion, and the stalks, after cutting off the top ends, immersed upside down in the tin. When the tin is full it can be taken to the edge of the field and the tops burnt.

SĂVULESCU (T.) & RAYSS (T.). **Troisième contribution à la connaissance des Péronosporacées de Roumanie.** [Third contribution to the knowledge of the Peronosporaceae of Rumania.] —*Ann. Mycol.*, xxxii, 1–2, pp. 36–51, 9 figs., 3 graphs, 1934.

An annotated list is given of 51 species of Peronosporaceae collected by the authors in Rumania since the publication of their previous contributions to the same subject [*R.A.M.*, xi, p. 605], bringing the total number so far known in the country to 162 on 248 hosts. *Peronospora jaczewskii* n. sp. ad int. on *Gypsophila muralis* appears to agree with a species recorded by Tranzschel and Jaczewski on the same host near Smolensk, Russia, which they considered to be related to *P. dianthi* (*Mycol. Flora Europ. Asiat. Ross.*, 1901).

P. rosae-gallicae n. sp. on *Rosa gallica* (stated to be the first record of a *Peronospora* on a wild rose) differs from *P. sparsa* [ibid., xi, pp. 459, 784] in its longer conidiophores and light brown conidia, 13 to 24 by 11 to 21 (mean 18·37 by 15·31) μ in diameter.

Living leaves of *Lathyrus hirsutus* are attacked by *P. lathyri hirsuti* n. sp., forming a dense, greyish-purple growth. The conidiophores arise singly or in groups from the stomata and measure 375 to 560 by 6 to 9 μ; they are furnished with 5 to 6 dichotomous, slightly curved or almost straight branches, terminating in straight or slightly curved forks 6 to 36 μ in length. The pale greyish-purple, ellipsoidal conidia are usually papillate, 12 to 27 (generally 18 to 24) by 11 to 24 (14 to 20) μ, mean 20·46

by 17·46 μ. The oospores, which are very abundant in decaying leaves, measure 33 to 42 μ in diameter and have a yellow, reticulate epispore.

Shear (C. L.). **Penicillium glaucum of Brefeld (Carpenteles of Langeron) refound.**—*Mycologia*, xxvi, 1, pp. 104–107, 3 figs., 1934.

In view of the ambiguity regarding the identity of the fungus described by Brefeld, who obtained its perithecial stage, as *Penicillium glaucum* Link, and of the confusion already existing in the use of this name, the writer proposes to call this organism, rediscovered apparently for the first time by O. A. Reinking in Honduras soils in 1931, *Carpenteles asperum* nom. nov. Cultures from ascospores and conidia reproduced the *Penicillium* conidia and the perithecia and ascospores as described by Brefeld. The generic name was proposed by Langeron (*Comptes rendus Soc. de Biol.*, lxxxvii, p. 343, 1922) for ascogenous species of *Penicillium*, *P. glaucum* (Lk) Brefeld to represent the type. The combination *C. glaucum* was used by Clements & Shear (The Genera of Fungi, p. 297, 1931). The specific name *asperum* refers to the spinulose ascospores. Under this new scheme of classification *P. brefeldianum* Dodge (*Mycologia*, xxv, p. 90, 1933) would become *C. brefeldianum* (Dodge) comb. nov. and *P. javanicum* van Beyma (*Ver. Kon. Akad. Wetensch.*, Amsterdam, xxvi, p. 16, 1929) *C. javanicum* (van Beyma) comb. nov.

Petri (L.). **Alcune considerazioni sopra i generi 'Deuterophoma' e 'Blastophoma'.** [Some reflections on the genera *Deuterophoma* and *Blastophoma*.]—*Phytopath. Zeitschr.*, vii, 1, pp. 117–119, 1934.

Referring to Klebahn's recent establishment of a new genus, *Blastophoma* [*R.A.M.*, xii, p. 790], for those *Phoma*-like Sphaeropsideae characterized by exogenous (budding) conidial formation, the writer points out that this genus may be considered synonymous with his genus *Deuterophoma* (type species *D. tracheiphila*, the causal organism of 'mal secco' of lemons in the Mediterranean Basin) [ibid., x, p. 182], if considered merely under the aspect of an astromatic Sphaeropsid with budding exogenous pycnospores. A wider significance, however, attaches to the designation of *Deuterophoma*, which is intended to express the relatively simple organization of the pycnidia in those astromatic species forming conidia by exogenous budding from most of the cells of a pseudoparenchyma occupying the centre of the pycnidium instead of from only the cells of a hymenium lining the cavity. On the same basis *Sclerophoma* [cf. ibid., iii, p. 305] corresponds to Klebahn's *Eusclerophoma*.

Boedijn (K. B.). **Ueber einige phragmosporen Dematiazeen.** [On some phragmosporous Dematiaceae.]—*Bull. Jard. Bot. Buitenzorg*, Sér. III, xiii, 1, pp. 120–134, 4 figs., 9 graphs, 1933.

The author describes and figures a new species of *Acrothecium*, *A. indicum*, which he regards as closely related to *A. multisporum*, the type species of *Acrothecium*. He concludes that the well-

known *Acrothecium lunatum* Wakker [*R.A.M.*, v, p. 136; vi, p. 144; vii, p. 712; ix, p. 507] is not a good *Acrothecium*, and makes it the type species of a new genus *Curvularia*, as *C. lunata*. Among other species, *Napicladium andropogonis* Zimmerm. becomes *C. andropogonis*, *A. penniseti* Mitra [ibid., i, p. 161] becomes *C. penniseti*, and *Helminthosporium inaequalis* Shear [ibid., ix, p. 532] becomes *C. inaequalis*.

Jochems (S. C. J.). **Verslag van het Deli Proefstation over het jaar 1933.** [Report of the Deli Experiment Station for the year 1933.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxxix, 56 pp., 1934.

The following are among the items of phytopathological interest in this report. On the two series of tobacco plots permanently sterilized [by steam] against slime disease [*Bacterium solanacearum*: *R.A.M.*, xii, p. 471], the condition of the crop in 1933 was fully equal to that of 1930, when sterilization was commenced [ibid., x, p. 561]. As in 1932 only one bed on one of the series developed slime disease in 1933.

Tomato plants were grown in frames containing soil of varying composition and hydrogen-ion concentration in order to test the relation between soil reaction and infection with *Bact. solanacearum*, field observations and experiments having indicated that the disease was prevalent in soils near neutrality but absent from those that were strongly acid or alkaline. In contrast, however, to tobacco and *Ricinus communis*, which developed slime disease in these soils when they were of a moderately acid or alkaline reaction, tomatoes did not contract infection in black dust ['zwarte stofgrond'] or red soils. It was thought that the disease-free soils might not be actually free from the bacteria but that the infective capacity of the latter was merely inhibited by the degree of acidity or alkalinity. No slime disease occurred, however, in a series of nine frames filled with these soils that had given no infection, even when the hydrogen-ion concentration was adjusted to range from P_H 3·8 to 8·2, whence it may be inferred that the absence of symptoms in certain soils of an acid or alkaline reaction does actually connote the freedom of such soils from *Bact. solanacearum*.

The rough handling of seedlings during raising operations is believed to be largely responsible for the spread of ordinary mosaic ('peh-sim') [ibid., xiii, p. 328], which is conveyed from plant to plant as the basal leaves are broken off by contaminated fingers.

Information has been received from A. Meurs that the *Pythium* spp. isolated from Sumatra tobacco [loc. cit.] and taken to Baarn, Holland, for closer study are *P. aphanidermatum*, *P. myriotylum* Drechsler [ibid., x, p. 211], and a new species named *P. deliense* Meurs.

Caldwell (J.). **Possible chemical nature of Tobacco mosaic virus.**—*Nature*, cxxxiii, 3353, p. 177, 1934.

In agreement with Barton-Wright and McBain [*R.A.M.*, xiii, p. 329], the writer detected the presence of the tobacco mosaic virus in the crystalline part of the mixed phosphate eleuate precipitated from the juice of inoculated *Nicotiana glutinosa* plants,

but the amount declines progressively with each successive washing until after repeated treatment very little remains. At this stage a trace of organic nitrogen is also revealed by microanalysis, no nitrogen-free virus-containing crystals having been obtained. No evidence is in fact forthcoming that the virus in the crystals is anything more than an impurity.

The absence of any specific relation between the crystals and the virus is readily demonstrable. On the acidification of the potassium-hydrogen phosphate eluate from healthy tobacco tissue and the addition of two volumes of acetone, a crystalline as well as a colloidal precipitate is obtained. That the crystals are due to the presence of potassium-hydrogen phosphate is further shown by the fact that the addition of two volumes of acetone to one of $M/1$ KH_2PO_4 in aqueous solution results in a heavy white precipitate of rhombic crystals, indistinguishable in outline from those obtained in the experiments referred to above.

Cordingley (H.), Grainger (J.), Pearsall (W. H.), & Wright (A.).—**The effect of mosaic disease upon certain metabolic products in the Tobacco plant.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 78–89, 1934.

The results of the experiments briefly described in this paper showed that in tobacco (*Nicotiana tabacum*) leaves infected with ordinary tobacco mosaic [*R.A.M.*, xii, p. 728] the proportion of nitrogen is higher and the proportion of carbohydrates lower than in healthy leaves, the differences being apparently increased during photosynthesis. In leaves kept in the dark for 68 hours, the carbohydrate loss on the dry weight basis was the same in both healthy and diseased leaves, but the loss fell chiefly on the insoluble carbohydrates in the healthy, and mainly on the disaccharides in the diseased leaves. The indications were that in diseased leaves protein breakdown is retarded, and insoluble substances are less readily hydrolyzed, the diseased leaves thus resembling older healthy leaves in their metabolism.

Samuel (G.). **The movement of Tobacco mosaic virus within the plant.**—*Ann. of Appl. Biol.*, xxi, 1, pp. 90–111, 1 pl., 4 diags., 1934.

The results of the author's study [by four methods, details of which are given] of the movement of tobacco mosaic virus [*R.A.M.*, xii, p. 791] chiefly in artificially inoculated tomato plants indicated, in agreement with those obtained by Holmes in tobacco plants [ibid., xii, p. 118], that for the first three or four days the virus remains confined to the inoculated leaf, the length of this period being in direct relationship with the greater or lesser growth activity of the host. After penetrating the stem, the virus travels first very rapidly down to the roots, and usually about a day later with equal rapidity to the top of the plant. In the earliest stages of entering the stem, the virus particles may be separated from each other by considerable distances, since successive samples taken from the diseased stem may yield lengths of 2·5 cm. free from infection, intercalated irregularly between portions containing the virus. When developing fruit trusses are present on the stem,

part of the virus may travel upwards as far as these trusses at the time when the initial downward movement is occurring, and it may then enter the developing fruits, while adjacent leaves remain uninfected for days or weeks.

In experiments with pot plants it was shown that after the initial rapid infection of the young developing leaves at the top of the plant, the more mature leaves were successively invaded from the top downwards and from the base upwards, until the whole plant was invaded. Complete invasion occurred very rapidly in small, vigorously growing plants, but took three weeks or more in those of medium size, and up to two months in large fruiting plants. Complete invasion never occurred when large tobacco or tomato plants with a number of mature leaves were inoculated in the field. The mature leaves remained free from the virus, apart from a limited invasion along the midribs, for periods of over three months after inoculation.

In a discussion of these results it is considered that they favour the theory that the virus moves slowly from cell to cell via the plasmodesmen, and is also rapidly distributed through the plant by way of the phloem. Particular mention is made of the possible value of the tobacco mosaic virus as an indicator in the study of the phloem movements.

Woods (M. W.). **Cellular changes in ring-spot.**—*Contrib. Boyce Thompson Inst.*, vi, 1, pp. 51–67, 3 figs., 1934.

Continuing his greenhouse studies of tobacco ring spot [*R.A.M.*, xiii, p. 131], the author states that the lesions formed on Turkish tobacco during the summer were normally much less necrotic than those formed in winter, and that in such lesions there appeared to be a certain connexion between the necrotic zonation and alternations of light and darkness. The cytological, and especially the histological changes caused by the virus depend in a large measure on the age of the affected tissues. In relatively mature leaves, both in primary and systemic lesions, the changes consist in a disintegration of the chloroplasts, either preceding, or coincident with, a modification of the cytoplasm resulting in increased permeability of the protoplast, and followed by the degeneration of the nucleus. Usually the chloroplasts become rather gorged with starch before they degenerate. The diseased cells collapse from desiccation, usually followed by oxidation to a brown colour. Sometimes, however, little or no plastid disintegration occurs before the death of the cell. In chlorotic areas in systemically infected leaves the development of the plastids may possibly be retarded. Some marked changes such as hypertrophy and lack of differentiation of some of the leaf cells near the necrotic areas were sometimes observed in systemic lesions formed on young leaves, but in nearly mature leaves the structure was little affected beyond the death of certain of the infected tissues.

In *Nicotiana rustica*, *N. glutinosa*, *N. glauca*, and *Petunia* sp. the cytological and histological changes caused by inoculation with the ring spot virus were much the same as those in nearly mature leaves of Turkish tobacco, but in *Vigna sinensis* the vascular tissues of the leaf were much more susceptible to the action of the

virus than in Turkish tobacco, where only small veins and the border parenchyma of larger ones are normally affected. Some details are also given of the effect of varying environmental conditions on the development of the ring spot lesions.

Blood (H. L.). **The control of Tomato bacterial canker (Aplanobacter michiganense E. F. S.) by fruit-pulp fermentation in the seed-extraction process.**—*Proc. Utah Acad. Sci.*, x, pp. 19–23, 1933. [Abs. in *Exper. Stat. Record*, lxx, 2, p. 197, 1934.]

The results so far obtained in preliminary tests carried out in Utah are considered to justify the recommendation to tomato seed producers of submitting the fruit-pulp to fermentation before seed extraction for the control of *Aplanobacter michiganense* [*R.A.M.*, xiii, p. 403]. The fruit may be placed in a container, crushed with an electrically driven rotary knife or mixer, and left to ferment without added water. When large quantities of seed are to be extracted, standard pulping or grinding machines may be used and the material run into vats and allowed to ferment for from three to six days at 68° F. or under.

Goss (R. W.) & Frink (P. R.). **Cephalosporium wilt and die-back of the White Elm.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 70, 24 pp., 12 figs., 2 graphs, 1934.

A species of *Cephalosporium*, believed to be identical with that attacking elms in Ohio and other parts of the United States [*R.A.M.*, xii, p. 404], has been found causing a disease of *Ulmus americana* in Nebraska. The initial symptoms of the disturbance are a slight drooping and yellowish-green mottling of the leaves, followed by upward rolling and brown discoloration, and ultimately by die-back of the twig or branch. These external features are usually preceded or accompanied by a diffuse brown streaking of the vascular tissue. When the trunk is involved the foliage is dwarfed, yellowish, rolled in the spring, and sometimes a rapid wilt of the whole top ensues. Inoculation of the roots, trunk, or twigs of seedlings with pure cultures caused typical symptoms, the first signs of infection appearing sometimes in 11 days and death within three months. Infection advanced more rapidly upwards than towards the roots. Chinese elms (*U. pumila*) failed to take the inoculations. A survey of the street plantings of elms at Lincoln showed that some 30 per cent. were infected or killed by the *Cephalosporium*, or had been replaced on account of the disease.

On potato-dextrose agar the fungus is characterized by a moderately branched, hyaline, septate mycelium and simple, 0- to 4-septate conidiophores, 7 to 18 μ long, bearing at their apices a succession of elliptical, hyaline, unicellular conidia, 4·5 by 1·9 μ, united by mucilage into globular heads of 50 to 80 spores. The minimum, optimum, and maximum temperatures for growth were above 3·5°, 25°, and below 35° C., respectively. The fungus caused a gradual adjustment of the reaction of the media towards neutrality.

Control methods should include the removal of diseased material from nurseries and ornamental plantings. Further studies of varietal reaction are needed and also of the possibilities of soil and

insect transmission—the latter probably being an important factor in the dissemination of the fungus by reason of its position within the tree.

ARNAUD (G.) & BARTHELET (J.). **Les chancres du Cédrela et du Robinia.** [Cankers of *Cedrela* and *Robinia*.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 9-10, pp. 323–332, 2 pl., 3 figs., 1933. [Received May, 1934.]

During the last ten or fifteen years *Cedrela sinensis* trees in the avenues of Paris have developed one or two large cankers resembling those produced on apples by *Nectria galligena* and situated about 2 m. from the ground on the trunk or main branches. As a rule, the canker starts at the point of insertion of a branch, and it can gradually spread more than half way through the thickness of the trunk, frequently attaining a length of 30 to 40 cm. Some trunks are affected from the ground to the first branches, apparently as a result of several cankers joining together. Affected trees succumb very slowly. Isolations from the margins of diseased tissues gave a *Fusicoccum* which, in culture on oatmeal agar, gave rise to brownish pycnidia, 2 to 5 mm. in diameter, with numerous loculi (which later may fuse to form irregular cavities) containing rod-shaped, bent B spores measuring 30 by 0·8 μ. The fungus, designated *F. cedrelae* n. sp. ad interim, scarcely differs from the B spore stage of a *Phomopsis* in its final characters, the two genera being almost identical. It is regarded as being mainly a wound parasite.

Acacias (*Robinia pseud-acacia*) both in the north and south of France are commonly attacked by *Diaporthe oncostoma*, chiefly in its pycnidial form, *Phomopsis oncostoma*. As a rule, the trees do not appear to be cankered, the fungus killing off the young, slender branches, which become covered with fructifications.

RICHTER (H.). **Krebs und Rindenbrand der Pappel.** [Canker and bark blight of the Poplar.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlv (*Jahrbuch*), pp. 262–267, 2 pl., 1933.

The first record of the *Nectria* canker of poplars, which has caused so much damage of recent years in Germany [*R.A.M.*, xii, p. 800], is stated by A. Poskin to date from 1875, when it was observed on *Populus canadensis* in Belgium [ibid., xii, p. 677]. The disease has also long been known in Holland, where it was studied by Miss Westerdijk and A. van Luijk and attributed to *N. coccinea* [ibid., iii, p. 430]; it first appeared in Germany near the Dutch border and spread to the Rhine Province. The writer has shown that a variety (*sanguinella*) of *N. coccinea* is able to infect poplar cortex but not to produce true canker [ibid., xii, p. 677]. In 1931 both Jahn and Liese drew attention to the ravages of poplar canker in Westphalia, the former ascribing the infection to *N. coccinea* var. *sanguinella* (*Deutscher Forstwirt*, xiii, p. 131) and the latter to *N. galligena* var. *major* [*R.A.M.*, x, p. 698]. The writer's extensive comparative studies in the affected localities and on herbarium material have confirmed the above-mentioned determinations and indicate that more than one species of *Nectria* can cause the disease. A strain of *N. galligena* identical

with that responsible for fruit tree canker was isolated from diseased poplars in the Rhine Province, the same species having already been found by Wollenweber on *P. nigra* in Norway in 1925 (Fusarium-Monographie, p. 467) [ibid., x, p. 626]. The following are the mean dimensions of the ascospores of the species and varieties of *Nectria* associated with poplar canker: *N. coccinea* var. *sanguinella* 17·72 by 4·86 μ, *N. galligena* 16·07 by 6·76 μ, and *N. galligena* var. *major* 19·03 by 7·03 μ.

As in previous experiments, the author's inoculation tests on poplars in 1931 with *N. coccinea* var. *sanguinella* and *N. galligena* var. *major* gave negative results as regards actual canker formation, though the slowness with which the wounds healed points to a certain infective capacity. The inoculated trees, moreover, were growing on a light, loamy sand which does not favour canker either in poplars, beeches, or apples. The poplar varieties hitherto observed to contract *Nectria* canker are *P. canadensis* and *P. robusta*, while *P. charkowiensis* appears to be also susceptible. Various insects have been observed in association with the cankers and may be actively concerned in transmission of their cause. Poplar canker can be directly combated only by the removal and burning of diseased trees, or in milder cases by the excision of the infected parts. An attempt should also be made to obtain resistant individuals from seed [cf. ibid., xiii, p. 338], while the extended cultivation of the indigenous *P. nigra*, *P. alba*, and *P. tremula* also deserves consideration.

Notes are given on the symptoms and distribution of the so-called 'French canker' of poplars [ibid., xiii, p. 408], which has not yet been recorded in Germany and is stated to differ from the *Nectria* disease. As in the latter case, the rapidly growing varieties, such as *P. canadensis*, *P. eugenei*, and *P. nigra* var. *italica* are the most susceptible.

The bark blight caused by *Dothichiza populea* [ibid., xii, p. 790] is stated to be spreading extensively in Germany. A brief description of the disease is given.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, October–December, 1933. Quarantine and other official announcements.—pp. 271–274, 277–288, 1934.

A further revision of Rice Quarantine No. 55 [*R.A.M.*, xiii, p. 416] provides for the entry into the United States of rice straw and rice hulls after treatment by steam or some other method approved by the Bureau of Plant Quarantine against certain fungous diseases and insect pests, to be carried out under qualified supervision at recognized ports where the proper facilities are available.

A summary (dated 1st December, 1933) is given of the quarantine restrictions governing the importation of plants and seeds into the Argentine Republic.